NAVAL RESEARCH ADVISORY PANEL

EXERCISE RECONSTRUCTION AND DATA COLLECTION

DETERMINING THE IMPACT OF ADVANCING

TECHNOLOGY ON EXERCISE RECONSTRUCTION

AND DATA COLLECTION

EXER 1

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EXER 2

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BRIEFERS

EXERCISE
RECONSTRUCTION
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DATA COLLECTION

ORGANIZATION	SUBJECT
COMMANDER THIRD FLEET STAFF	• PLANNING AND CONDUCT OF AN EXERCISE • FLEET REQUIREMENTS FOR DATA COLLECTION AND ANALYSIS, AND EXERCISE RECONSTRUCTION
COMMANDER SECOND FLEET STAFF	• FLEET REQUIREMENTS FOR DATA COLLECTION AND ANALYSIS, AND EXERCISE RECONSTRUCTION
NAVAL WARFARE ASSESSMENT CENTER	• DATA COLLECTION AND ANALYSIS, AND EXERCISE RECONSTRUCTION TECHNIQUES AND PROCEDURES • CARRY-ON INSTRUMENTATION AND RECONSTRUCTION SYSTEMS • WEAPONS ANALYSIS LAB PROJECT
CENTER FOR NAVAL ANALYSES	• DATA COLLECTION AND ANALYSIS, AND EXERCISE RECONSTRUCTION TECHNIQUES AND PROCEDURES
NAVY TACTICAL SUPPORT ACTIVITY	• CARRY-ON INSTRUMENTATION AND RECONSTRUCTION SYSTEMS
CHIEF OF NAVAL OPERATIONS (OP-05)/ COMMANDER NAVAL AIR SYSTEMS COMMAND STAFF	• TACTICAL COMBAT TRAINING SYSTEMS (TCTS), MOBILE SEA RANGE (MSR), AND TRAINING RANGES

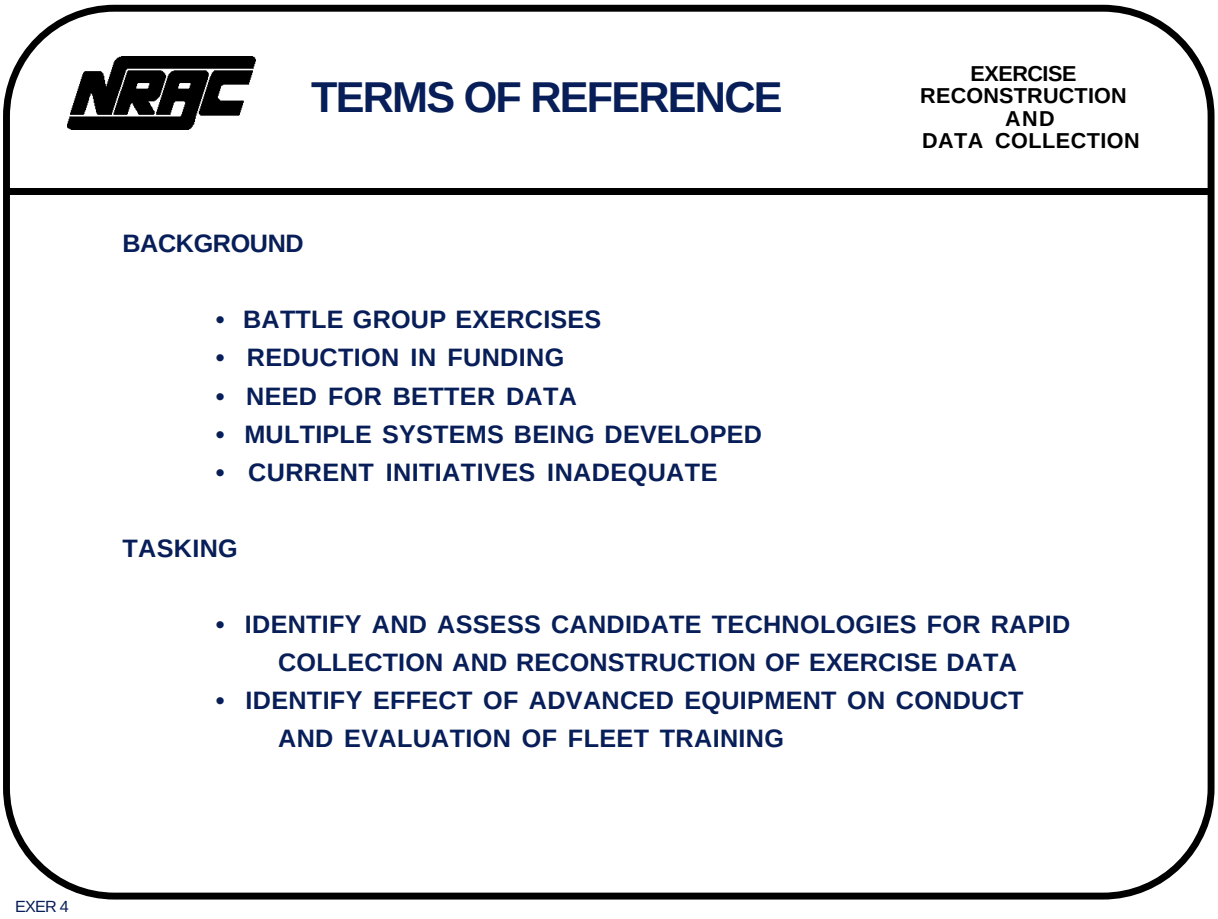
EXER 3

BRIEFERS (CONT.)

EXERCISE RECONSTRUCTION AND DATA COLLECTION

ORGANIZATION	SUBJECT
BOLT, BERANEK AND NEWMAN (BBN)	• SATELLITE COMMUNICATIONS
COMMANDER FIGHTER WING ONE STAFF	• TACTS/ACMR RANGES
HUGHES SPACE AND COMMUNICATIONS GROUP	• DATA RELAY SYSTEMS
MOTOROLA GOVERNMENT ELECTRONICS GROUP	• COMMUNICATIONS SECURITY SYSTEMS
COMSAT MARITIME SERVICES	• MARITIME SATELLITE LINKS
FORD AEROSPACE	• TEST AND TRAINING RANGE SYSTEMS
COMMANDER-IN-CHIEF ATLANTIC FLEET STAFF	• WHITE CELL EXERCISE RECONSTRUCTION SYSTEMS AND OPERATIONS
MARYLAND ADVANCED DEVELOPMENT LABORATORY	• TTMA TACTICAL FUSION PROCESS
RADM MORRIS, CINCLANTFLT STAFF	• BATTLE GROUP COMMANDER PERSPECTIVE
VADM MILLER, DCNO FOR NAVAL WARFARE	• TACTICAL TRAINING PERSPECTIVE

EXER 3A



Terms of Reference

DETERMINE THE IMPACT OF ADVANCING TECHNOLOGY ON EXERCISE RECONSTRUCTION AND DATA COLLECTION

1. GENERAL OBJECTIVE

Provide an assessment of advancing technology on exercise reconstruction and data collection. Identify alternatives for applying this technology to obtain and reconstruct the data necessary to support the Fleet and OPNAV assessment programs.

2. BACKGROUND

a. The assessment and improvement of fleet tactical readiness is a major concern of all hands. With a reduction in funding for all the services, the way that training is conducted and evaluated must be reviewed with an eye towards utilizing the advancements made in technology.

b. Essential to any evaluation and analysis programs is the availability of adequate operational data and the means to quickly convert these data to information products usable by fleet personnel and analysts.

c. In response to this Navy-wide need for data acquisition and reconstruction systems,

several important contributions in the areas of carry-on instrumentation, reconstruction systems, fleet training ranges, and tactical decision aids have been made. CINCLANTFLT is also experimenting with real-time data collection, exercise reconstruction and analyses conducted ashore in support of fleet exercises.

d. The data acquisition and reconstruction system initiatives do not presently provide the full capability needed to rapidly assess battle group operations across all warfare mission areas. The systems which exist today lack mutual compatibility and are generally restricted in availability and applicability.

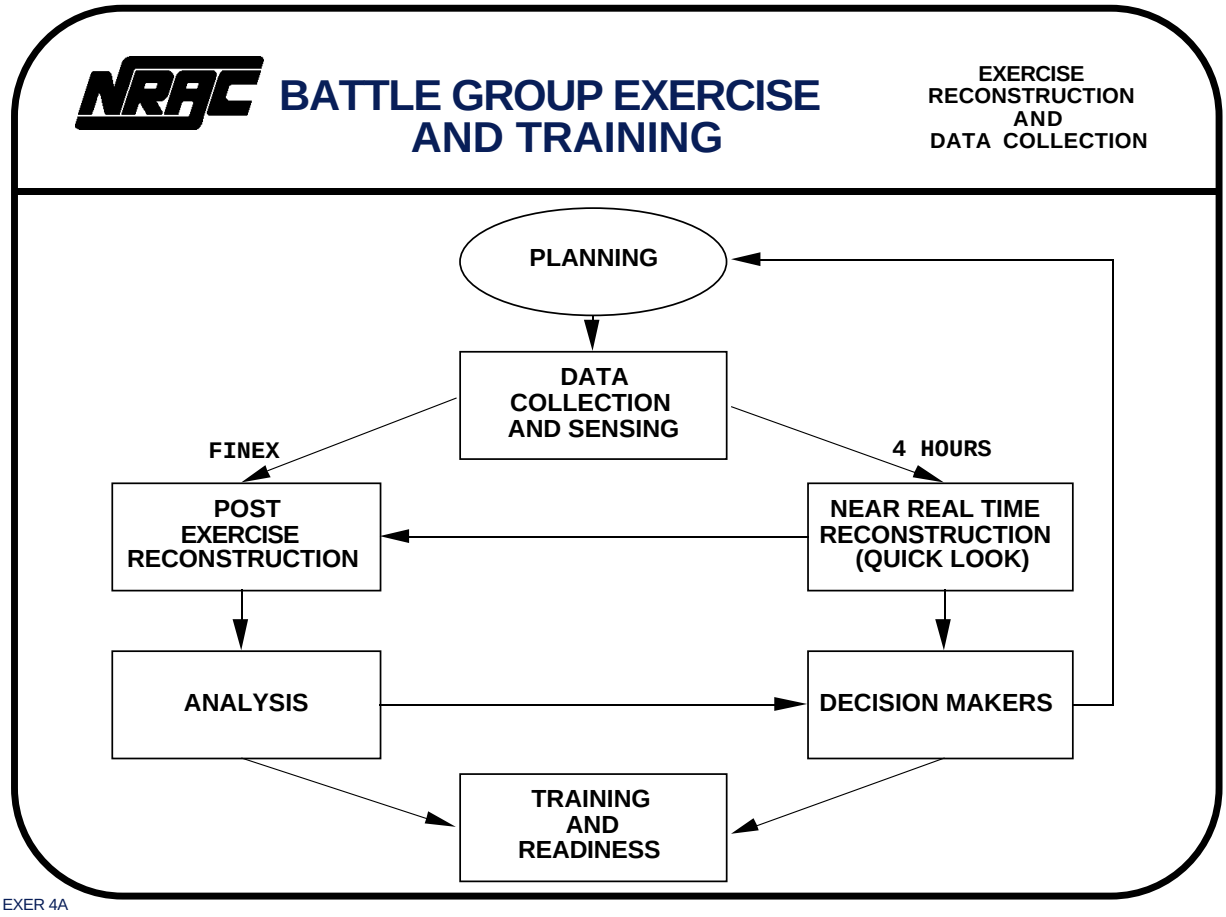
3. SPECIFIC TASKING

a. With emphasis on training always paramount and ever increasing, identify those advanced technology systems that will enable the rapid collection and reconstruction of exercise data, while minimizing impact on afloat operations.

b. Identify the effect that this advanced equipment will have on the way the Navy conducts and evaluates fleet training with the ultimate goal of improving fleet readiness.

4. POINT OF CONTACT

CDR Charlie B. Williams, OPNAV 733C, 693-5678.



BATTLE GROUP EXERCISE AND TRAINING

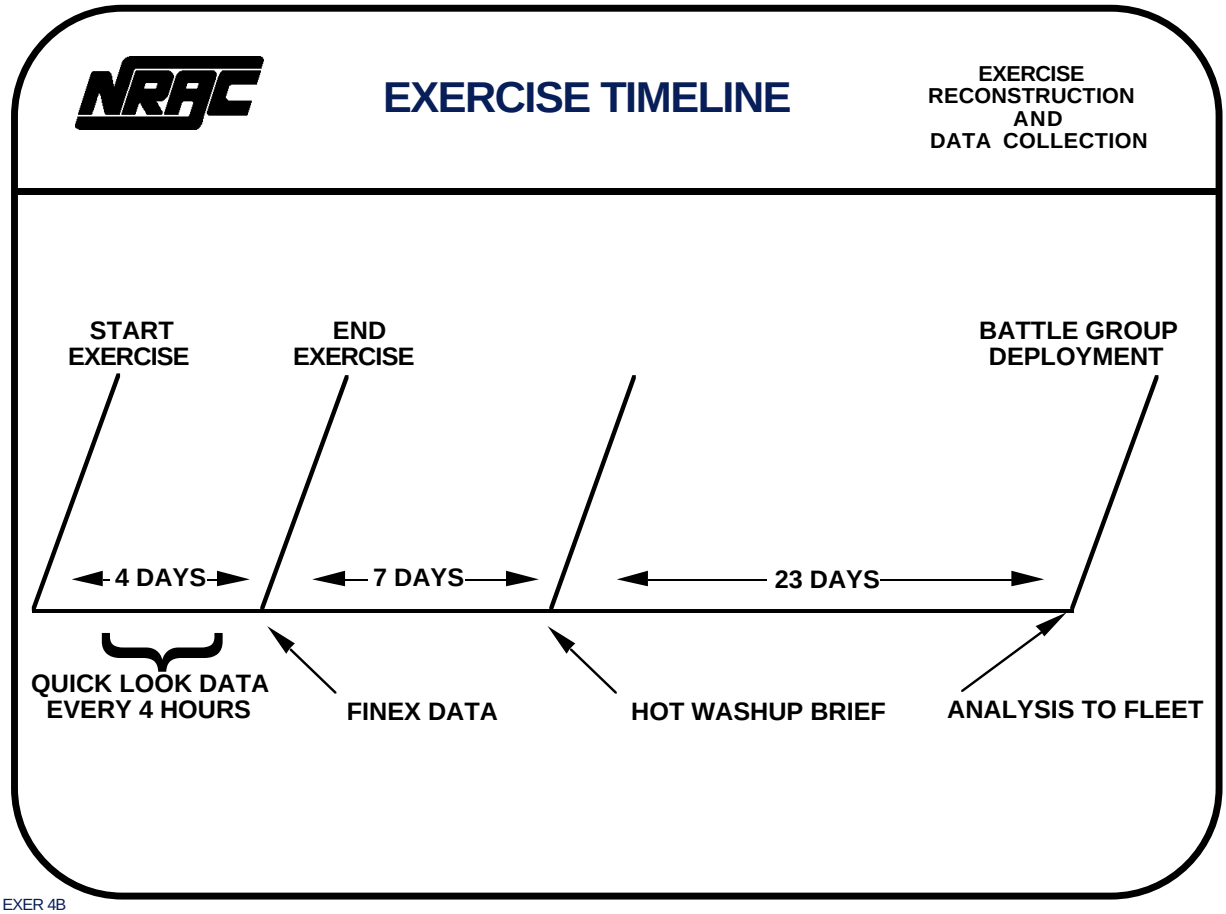
Two types of reconstruction are used in battle group exercises. In one case, the fleet and battle group commanders need limited data and rapid reconstruction of events to provide quick looks as the exercise progresses. While the typical 3-4 day exercise is in progress the Fleet Commander, Battle Group Commander, Warfare Commander and the Unit Commander need timely feedback to correct or improve on tactics during the remainder of the exercise. Although not used at present, these results could also be applied for "kill removal" of some of the participating units.

Much more extensive data are required to support a post-exercise reconstruction and for a detailed analysis of the exercise. This reconstruction more accurately determines what happened in the exercise; the analysis attempts to determine why it happened. The principal reason for the analysis of battle group exercises is to evaluate the performance of the warfare commanders in their choice of tactics, allocation of resources, and evaluation of the threat. The post-exercise reconstruction and analysis results are then fed back to the fleet, battle group, and warfare commanders who participated in the exercise, as well as to battle group and warfare commanders who are planning future exercises.

The quality of data collected in a battle group exercise is critical to both the quick looks and the longer term reconstruction and analysis. Without good data, the lessons learned from an exercise are not as complete as they might be

— and may even be incorrect. Hence, bad data may influence not only the understanding of a single exercise but the planning for future exercises and operations as well.

The results of the detailed exercise reconstructions and analyses should be retained and periodically aggregated by CNA and the fleet tactical training groups to estimate fleet readiness as well as trends in capabilities. It is important, therefore, that data collection and reconstruction be consistent from exercise to exercise, and that results be reported in a consistent fashion.

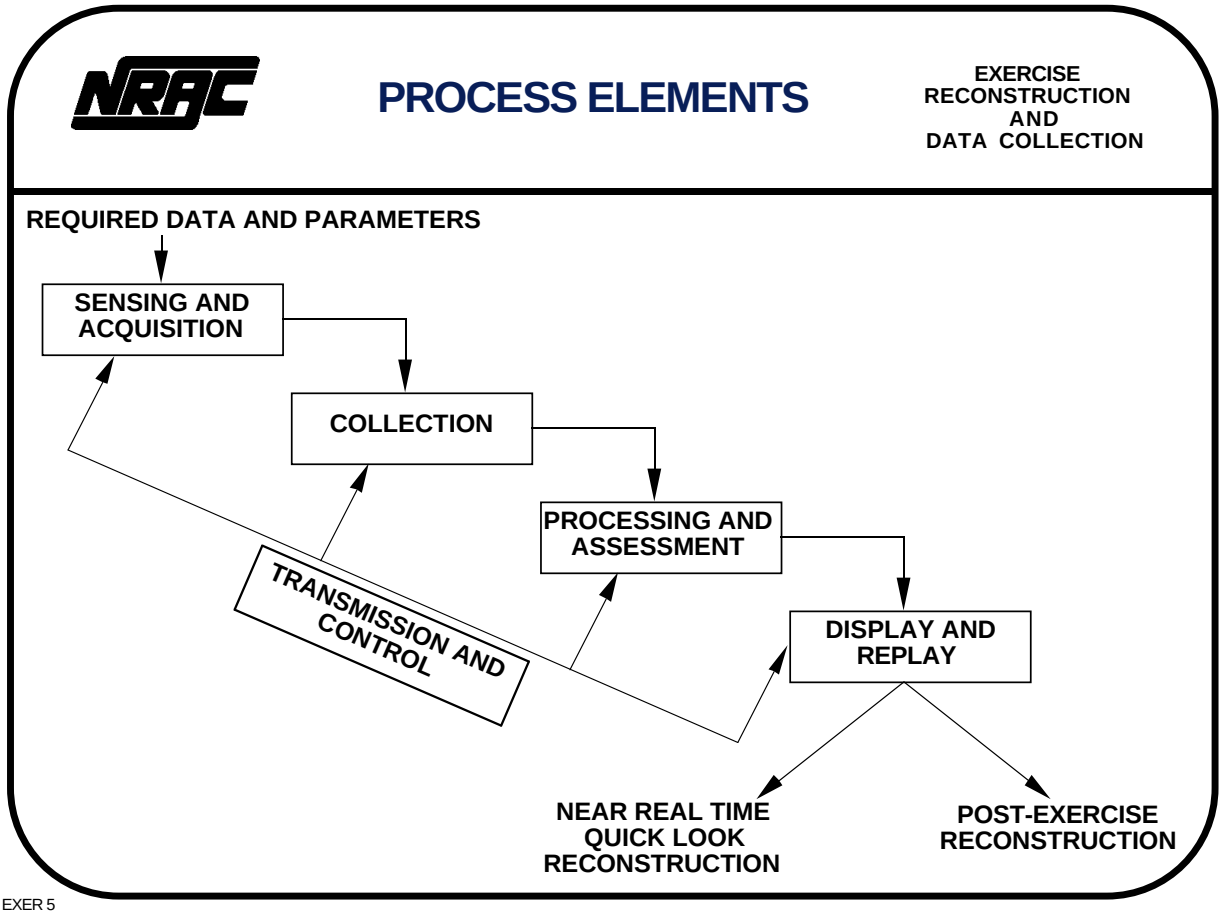


EXERCISE TIMELINE

As previously discussed, a four hour quick look with only a modest amount of information enables corrections of tactics and asset utilization during the remainder of the exercise. Also, the training benefit is enhanced by rapid feedback while the events are still fresh in the minds of the participants.

At the completion of the hostilities phase of the exercise, FINEX, all of the data to be used in the analysis should be available. Within seven days of this time, a preliminary briefing (Hot Washup Briefing) should be given to the BGC and subsequently to the warfare commanders, units and Fleet Commander. These briefings should contain accurate position and event data, but only limited analysis.

The final analysis needs to be delivered to the BGC within 30 days of FINEX. This enables the BGC to correct deficiencies during the deployment transit phase. When the tempo of operation permits a concentration on the lessons learned. History shows that when this analysis is received later, it gets lost in the press of activity associated with the deployment.



PROCESS ELEMENTS

The panel analyzed the exercise reconstruction process by breaking it down into four sequential elements with a common transmission and control element.

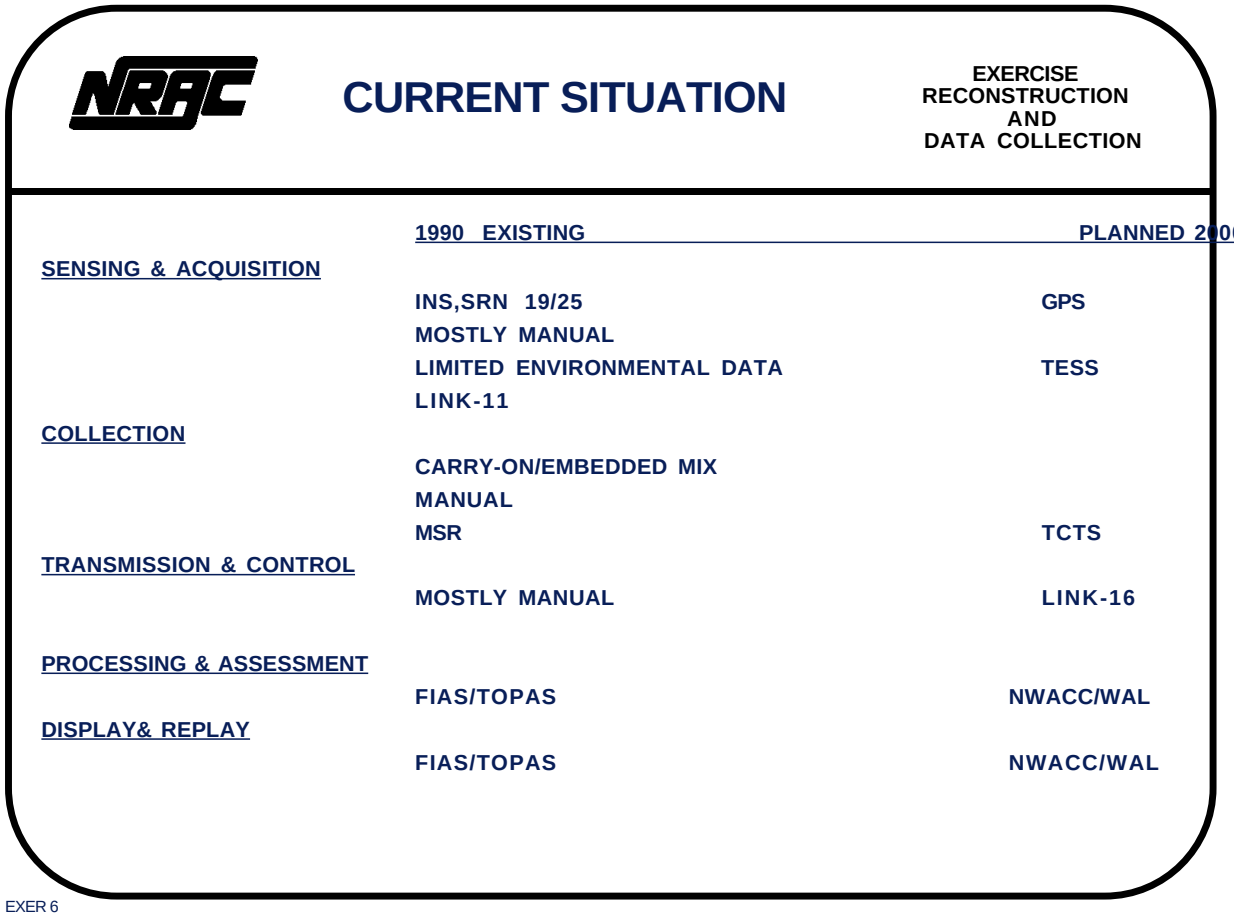
The first element consists primarily of sensing position data and significant events. Examples of events might include detection, identification, and engagements. Other important parameters affecting the exercise, such as environmental conditions, would also be included.

The second element deals with central collection, storage, and management of data acquired aboard individual platforms by the primary sensor systems.

In the processing and assessment phase, data are sorted, combined, and correlated in a format suitable for exercise analysis.

The objective of the display and replay element is to present to the decision maker in an easily understood format both what happened (of primary importance for quick look) and why (especially after the exercise is complete).

Common to all elements in the chart are reliable transmission links and suitable protocols which permit high-speed, secure data flow.



Current Situation

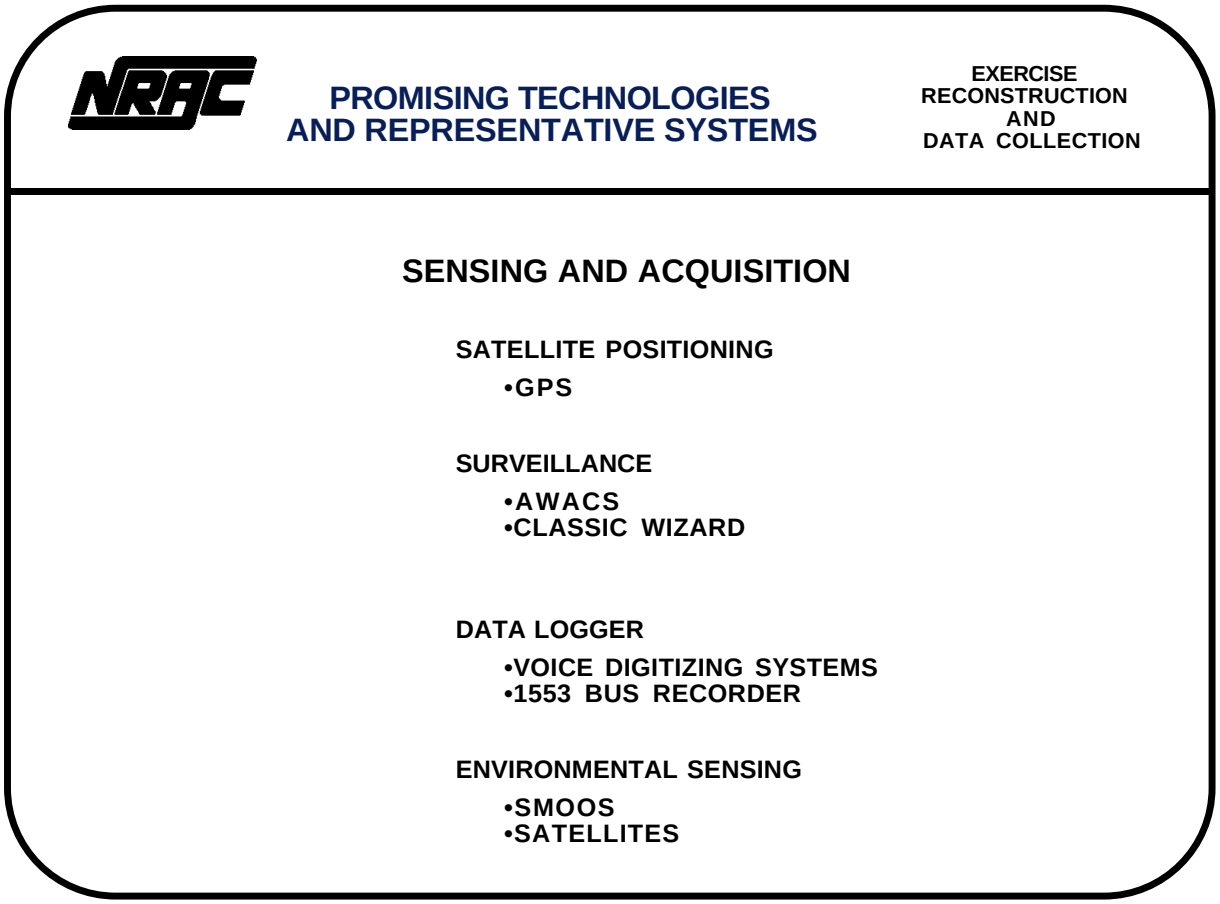
This chart summarizes the Panel's understanding of the current situation, including existing and planned systems. This understanding is our distillation and interpretation of the briefings and reports previously identified. The items are shown in general accord with the system elements of sensing and acquisition, collection, transmission and control, processing and assessment, and display and replay.

Salient aspects of the current situation are:

The large extent of manual effort throughout the process, especially at the front end with resulting labor and time intensive intrusion upon operational systems.

The large number of diverse items, each to accomplish a relatively narrow range of tasks, and coordinated only with considerable employment of personnel and money.

Current planning includes items of substantial development and operating cost, proceeding more or less independently with incomplete assurance that their implementation will result in an overall integrated, cost effective process.



PROMISING TECHNOLOGIES AND REPRESENTATIVE SYSTEMS
SENSING AND ACQUISITION

For all the elements in exercise reconstruction, there is adequate technology currently available which, if implemented in a coordinated program will meet the needs of the fleet.

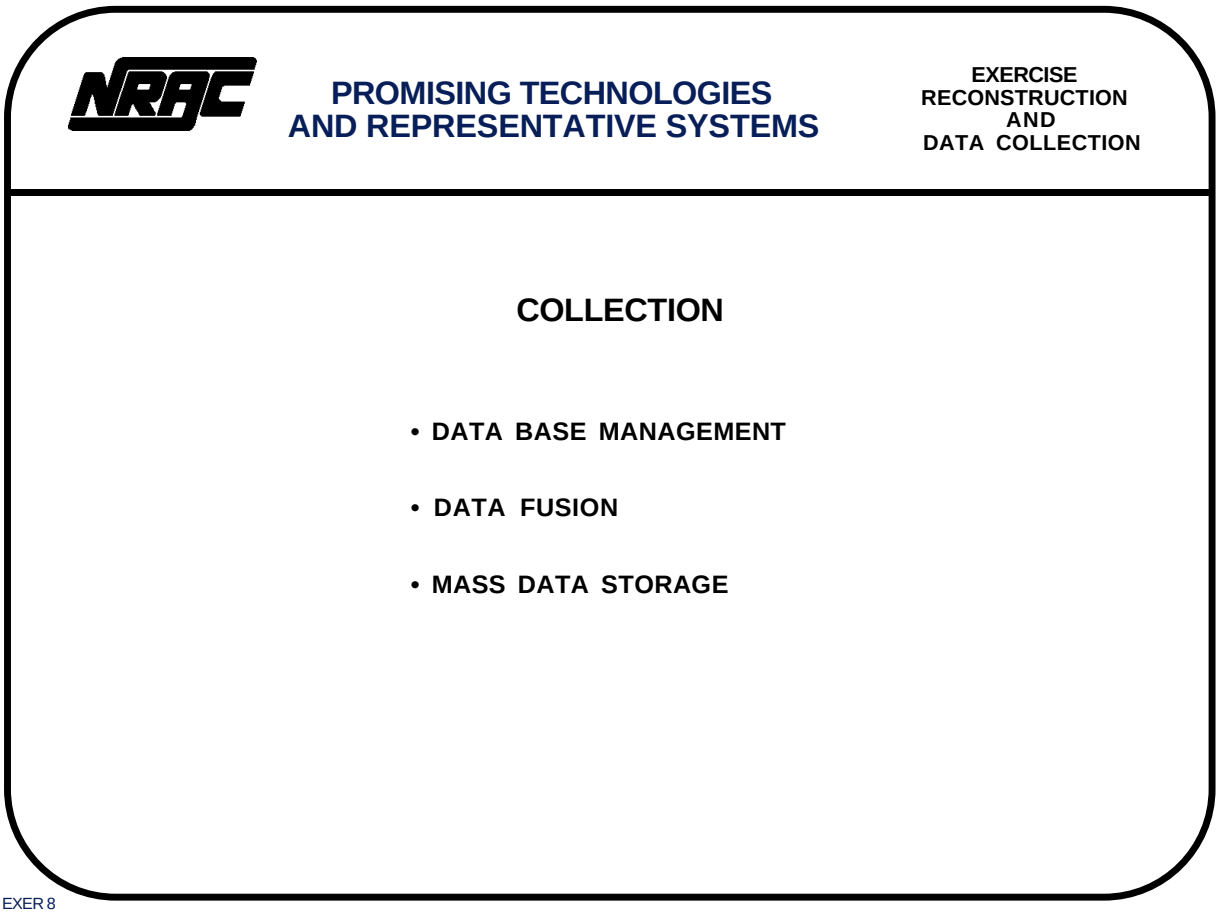
The Global Positioning System (GPS) provides one of the quickest and highest pay-off technologies for exercise reconstruction. GPS in all surface ships and aircraft, when combined with automated data extraction and transmission, will provide position data which satisfy projected requirements, and may eliminate the need for highly instrumented ranges.

In addition to existing air and undersea systems, increased use of the E-3 aircraft (AWACS), combined with improved turnaround of data extraction from mission tapes, would provide a more comprehensive picture of platform location, including “white” shipping and aircraft. Advanced Electronic Surveillance Measures (ESM) technologies such as Classic Wizard can be exploited to further enhance the data sensing and acquisition process.

Advanced technologies have recently become available that will minimize intrusion into normal operations and contribute to automated acquisition of data. Examples include voice digitizing, which both eliminates the need for laborious hand-logging and allows rapid search and playback, and high-speed data buses which provide automated access to a large number of platform

parameters.

The Shipboard Meteorological and Oceanographic Observing System (SMOOS) includes a suite of environmental sensors. When combined with available military and civilian environmental sensing satellites, a state-of-the-art environmental sensing capability will exist for exercise support.



PROMISING TECHNOLOGIES AND REPRESENTATIVE SYSTEMS

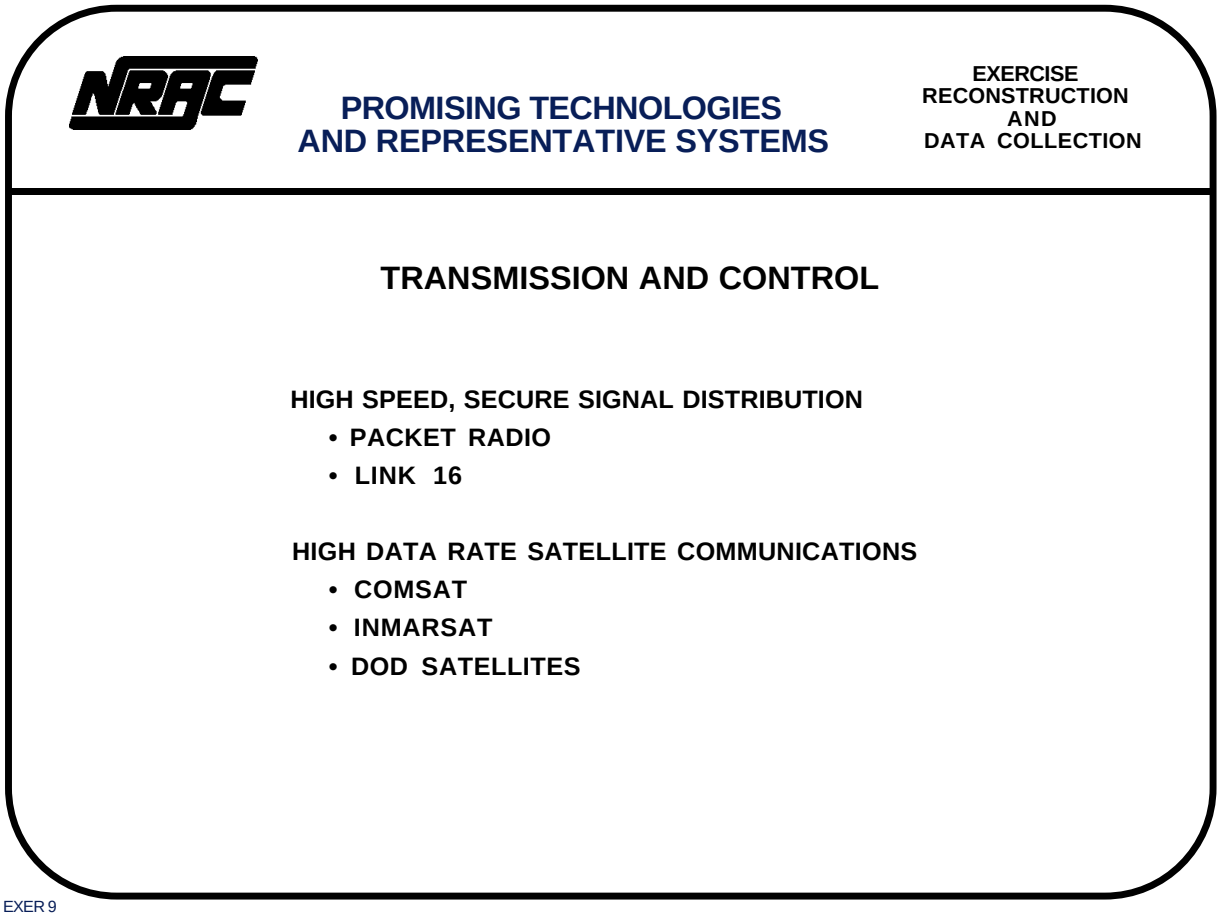
COLLECTION

Collection, storage, and management of data in a variety of formats is an area of rapidly developing commercial technology that can be directly applied to exercise reconstruction. A major advantage of using commercial software is that neither development nor maintenance costs are borne by the Navy.

For example, commercial data base management systems provide a means to sort, organize, and rapidly extract data from a variety of data sources using a PC and relatively simple software routines.

Data fusion techniques now in wide use in the command and control arena are also applicable to the exercise data collection effort. Currently, the combining of exercise data from different sources and in different formats is a time-consuming and labor-intensive process.

The potentially vast amount of data acquired during a battle group training exercise will require utilization of modern mass data storage devices, such as optical discs and high-density magnetic storage media.

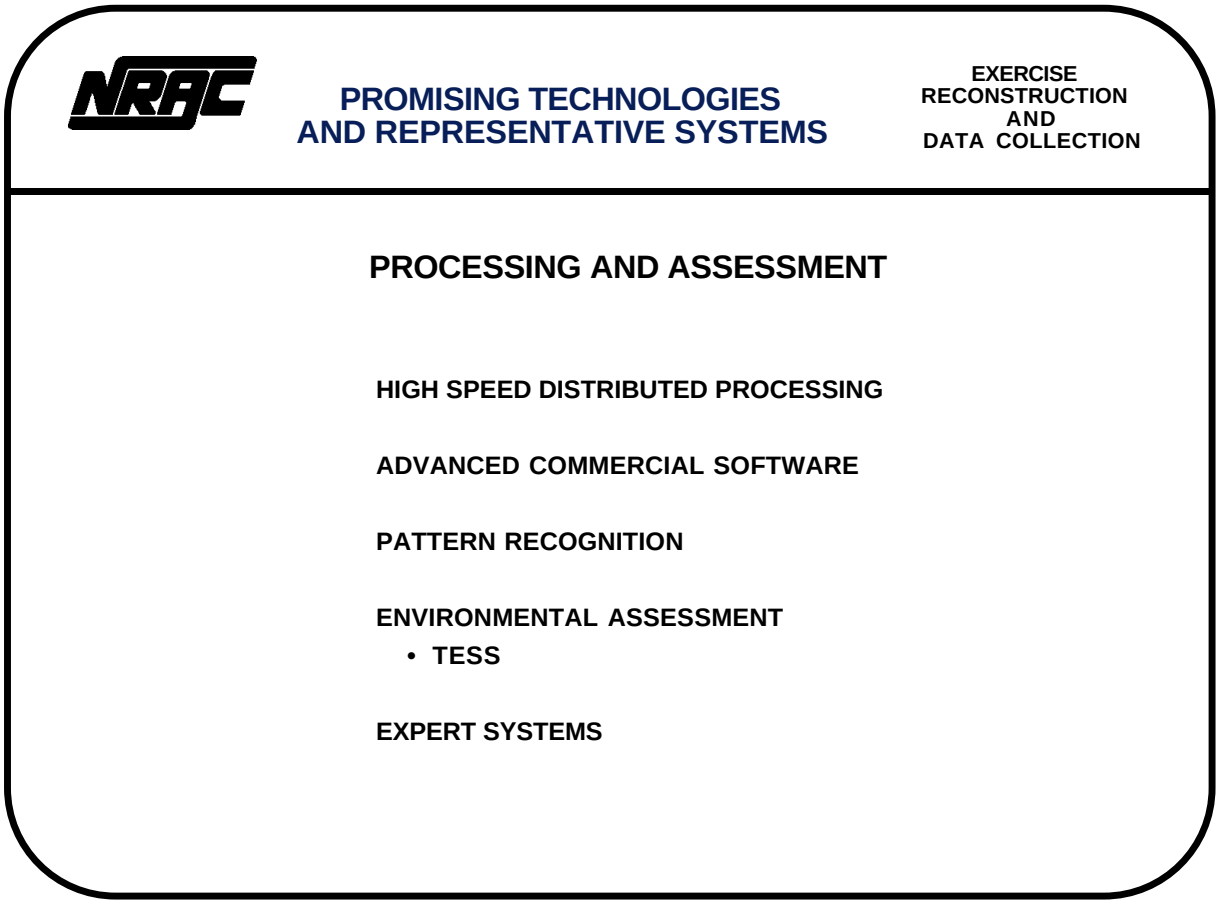


PROMISING TECHNOLOGIES AND REPRESENTATIVE SYSTEMS
TRANSMISSION AND CONTROL

There exists a mix of technologies that can be adapted to move data between the sensors and central collection points without burden to tactical communications.

Packet switching technology applied to both line-of-sight and satellite links provides the necessary data transfer capability to a central collection site without burdening available communications channels. Present tactical data links often do not have the capacity to transmit large volumes of exercise data; the much higher capacity of LINK-16 is expected to alleviate this problem.

Access to commercial communication satellite systems is widely available today and can be used to complement tactical channels for transmission of exercise data between ships and reconstruction facilities ashore.



EXER 10

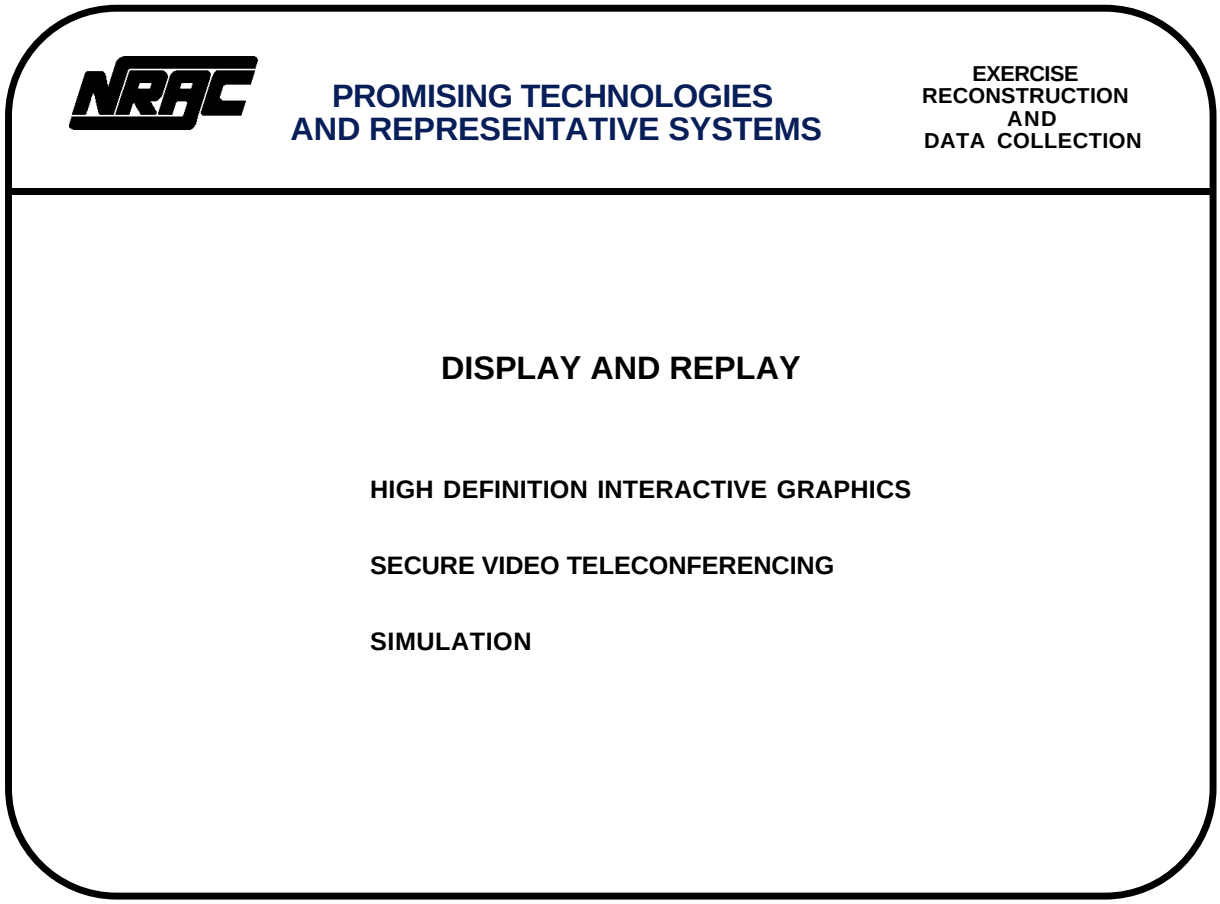
PROMISING TECHNOLOGIES AND REPRESENTATIVE SYSTEMS

PROCESSING AND ASSESSMENT

Again, the highly competitive commercial market offers ready solutions to the problems of sorting and merging data in diverse formats from a variety of sensors.

Small size and low cost have made powerful computing capabilities widely available. When combined with advanced commercial software, these systems offer great promise for automation of data processing. For example, pattern recognition techniques will allow vast amounts of radar and imaging data to be scanned accurately and rapidly. Expert systems software offers a means for capturing the knowledge of analysts, statisticians and other key personnel.

The Navy's Tactical Environmental Support System (TESS) provides secure, responsive, and robust environmental support, including quantification and display of environmental satellite data.



EXER 11

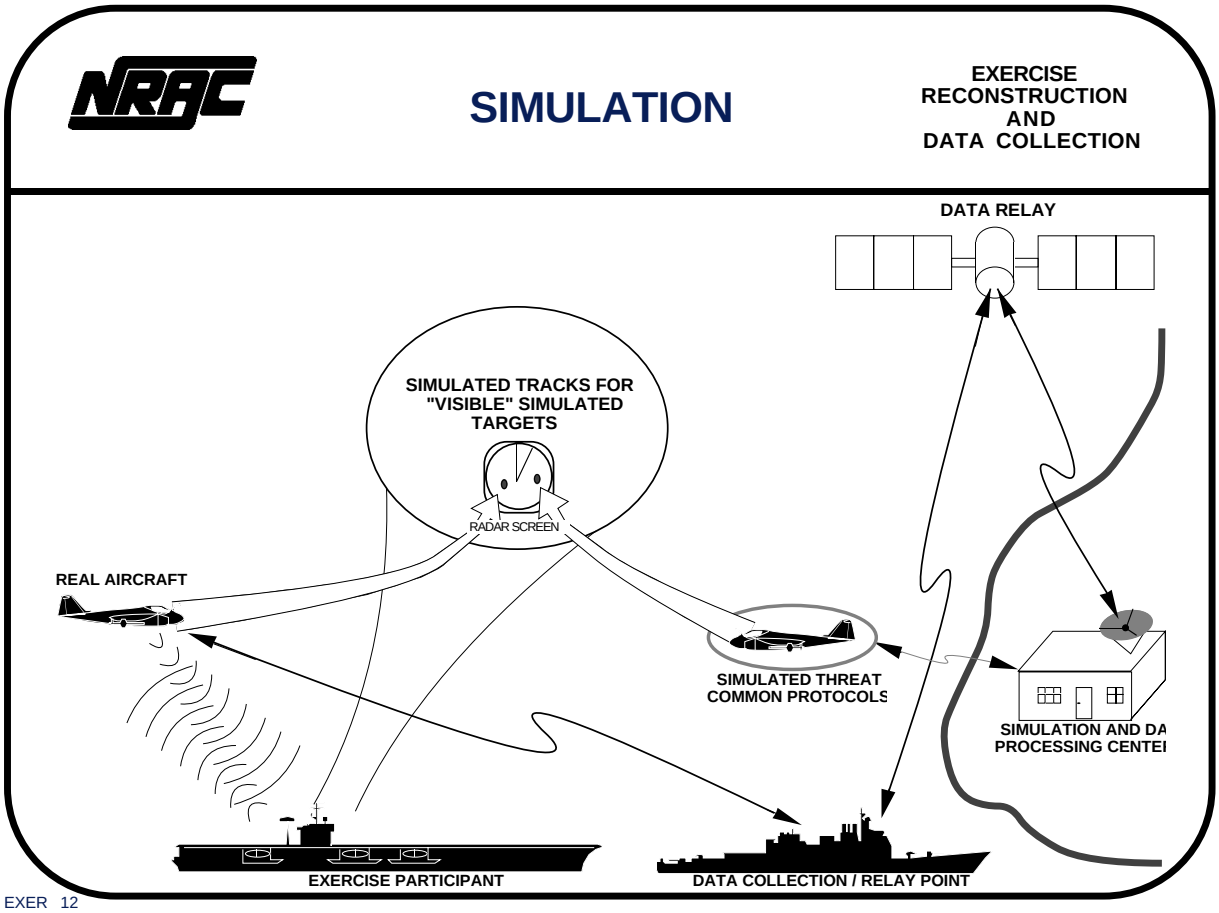
PROMISING TECHNOLOGIES AND REPRESENTATIVE SYSTEMS

DISPLAY AND REPLAY

Truly exciting technologies exist or are becoming available that will enable clear and rapid feedback of exercise results to decision makers at all levels.

High-definition, interactive graphics will enable a TACTS-like replay of exercise events to be viewed by commanders for the quick look as well as for post-exercise reconstruction. This capability can support display and replay via teleconferencing, enabling exercise debriefing without the need to assemble all the participants in a single location.

Simulation is another key technology that will increase training effectiveness by allowing real and simulated assets to participate together in a common exercise. SIMNET protocols being developed under DARPA/Army sponsorship offer promise as a potential baseline for the incorporation of simulated assets into Navy battle group exercises.

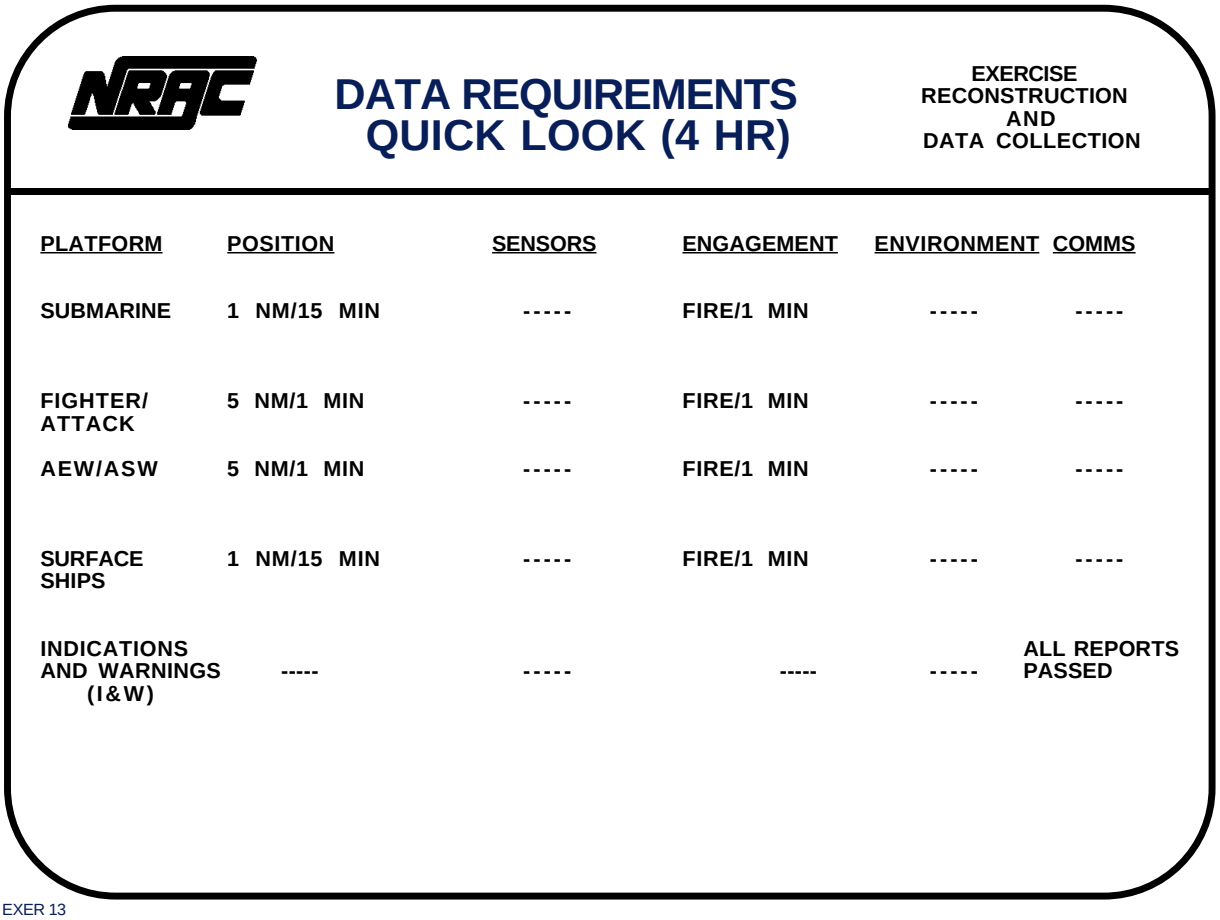


SIMULATION

The information transmitted among simulators — vehicle appearance messages, weapon firings, etc. — is essentially the same data that must be recorded for exercise reconstruction. With proper design, it is possible to develop common protocols that will allow real vehicles and simulated vehicles to participate together in a common exercise. Fairly simple simulations of a real vehicle's sensors can be used to calculate which simulated vehicles would be detected, tracked, and displayed; the vehicle state information for these vehicles can then be injected into the final stage of the sensor's display buffers. Conversely, the state variables being recorded from a real vehicle can be transformed into vehicle appearance messages and broadcast on the simulation network. This information is all that is required for a simulated vehicle to present a realistic sensor image to the crew of a simulated vehicle.

Interoperability between real and simulated vehicles, once achieved, can be exploited in many useful ways. The most obvious benefit is that of expanding an exercise to include much larger numbers of platforms at minimal cost, greatly increasing exercise richness and complexity. Other benefits include the ability to "dry-run" an exercise in port, practicing key parts of the script to reduce the probability of miscues and foulups, and to make sure that the exercise plan will generate the desired information. In addition, the simulation system can be used to replay key portions of the exercise for direct visual observation and study - both the real and the simulated vehicles can be observed from the viewpoint of any selected display screen. Critical points in the exer-

cise may also be selected as initial conditions for additional simulation exercises, which can be used to assess the probable effects of alternative courses of action. This information, in turn, can be used to design new exercises involving real platforms, closing the feedback loop and enhancing further training for the forces involved.

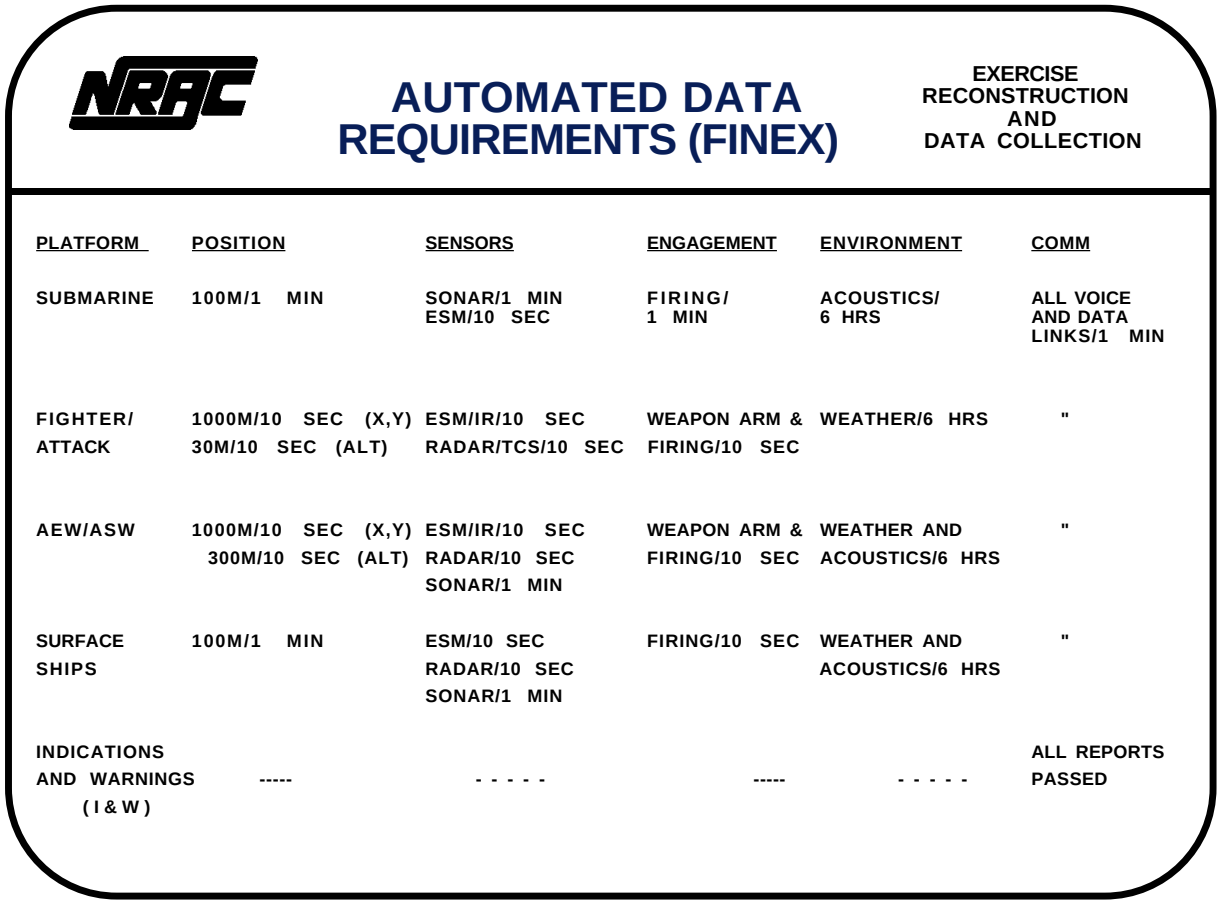


DATA REQUIREMENTS QUICK LOOK (4 HR)

Quick look reconstruction is designed to provide rapid feedback and can be used to identify strengths and weaknesses in tactical planning and execution, as well as basic training weaknesses.

The quick look feedback will also enable evaluation of asset employment and allow limited kill removal.

Quick look reconstruction requires a relatively small subset of position and key event data that can be rapidly collected, transferred, and merged into a coherent picture. These data are not intended to support TACTS-like evaluations of individual performance.

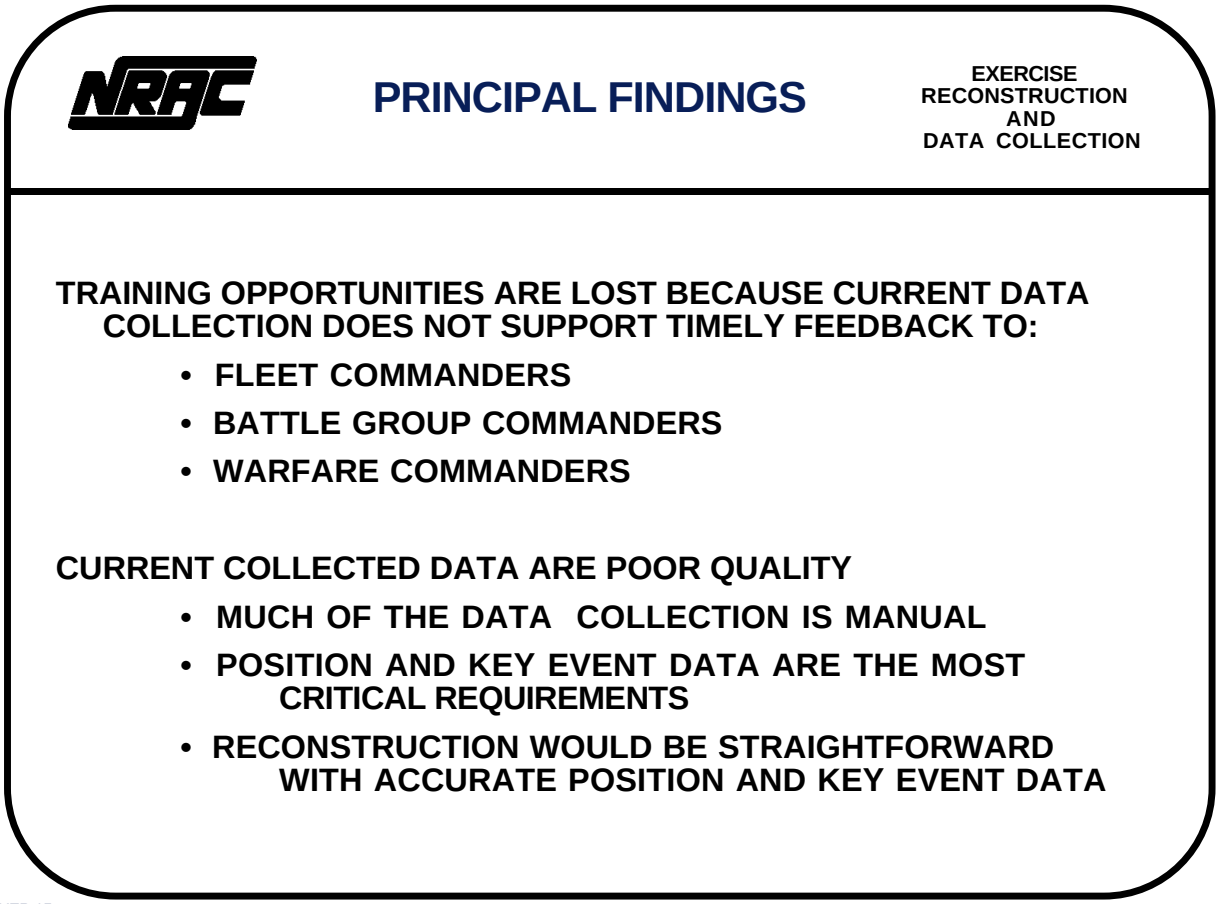


EXER 14

AUTOMATED DATA REQUIREMENTS (FINEX)

Data requirements at FINEX are more extensive because of the added quality necessary to support reconstruction, performance assessment and follow-on analysis. The data are not intended to support weapons effectiveness studies but must be sufficient to meet fleet needs for the following categories.

1. Reconstruction and Feedback for exercise participants:
   - Detection opportunities versus detections
   - Valid versus invalid prosecutions
   - Environment effects
   - Indentify training deficiencies
   - Effectiveness of planning and tactical execution
2. Analyst Support:
   - To determine underlying cause
   - Follow-on tactical studies
3. Determine shortfalls in the training scenario and recommend changes to maximize future training.



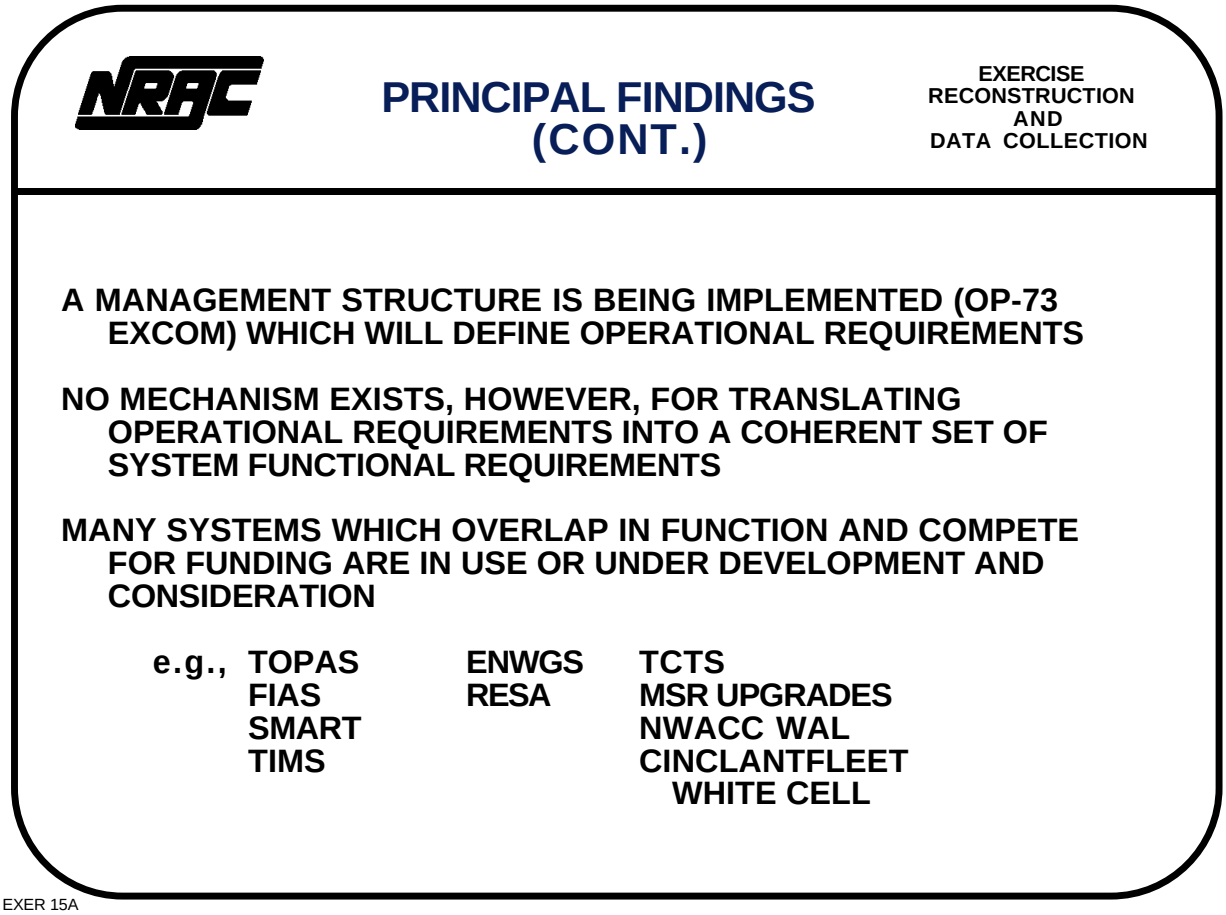
PRINCIPAL FINDINGS

In order to realize the full training benefit of fleet exercises, it is essential that quick look reconstructions be returned to participating commanders in near real time. The critical elements in quick look reconstructions are reliable position data and relevant information on key events. Examples of the latter are target detection and weapon firings. A feedback delay of approximately 4 hours was determined to be adequate for such reconstruction.

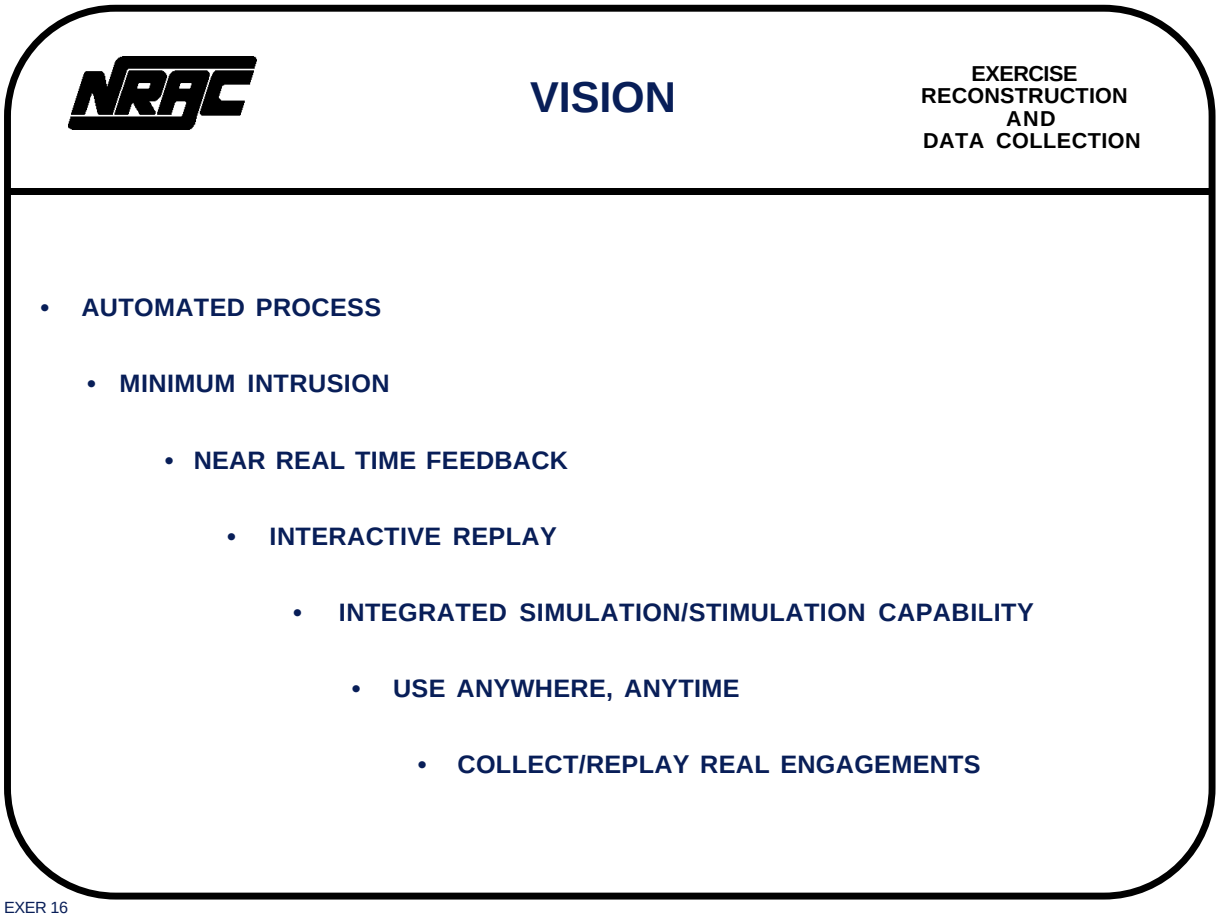
The quality of exercise data currently being collected is very poor, which makes reconstruction difficult and time-consuming. Reconstruction is presently hampered by a lack of automation in the data acquisition, dissemination, and reduction process. Reconstruction would be straightforward if accurate position and key-event information were available when needed. Today, inaccuracies in position data necessitate time-consuming manual track rectification procedures.

A large number of systems are currently either under development or are being considered whose functions relate to data collection and exercise reconstruction. Unfortunately, these systems tend to overlap and compete to varying degrees. No integrated plan exists which addresses the near- or far-term training and readiness needs of the fleet.

OP-73 has formed an executive committee on exercise data collection which includes representatives of the fleets, the laboratories, and CNA. This



group can make major contributions to the development of meaningful operational requirements. However, there is still a need for a mechanism to translate these operational requirements into a coherent system design. This systems engineering input is absolutely critical to the successful development of an integrated system.



VISION

The panel's vision embodies the following major criteria:

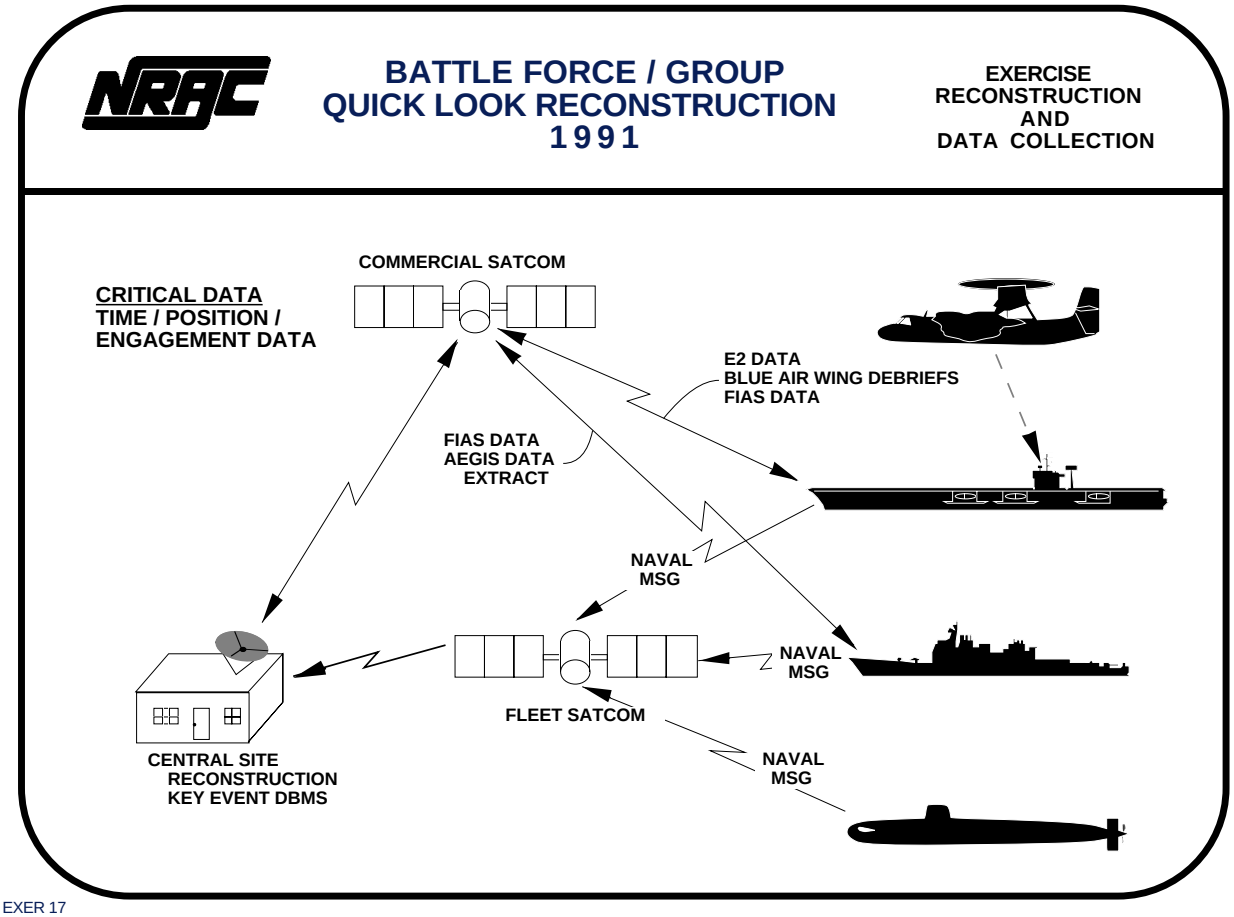
- Means to maximize effectiveness of the limited time and resources available for the battle group exercise. These include automating as much of the process as possible, and having near-real-time feedback and interactive replay.
- Features to exploit and reinforce classroom and in-port training experiences and to facilitate acquisition of lessons learned from real engagements.
- Minimization of data collection demands on exercise participants.
- Minimization of intrusion by data collection upon combat operational systems.

The panel's approach incorporates the following:

- An incremental, building block evolution.
- An integrated overall process that accommodates old and new platforms, real and simulated assets, and the multiple environments of classroom, in port, battle group exercise and real engagements.
- Utilization of available technologies, including contributions of other services and agencies, such as the Joint Services Aircraft Range Ap-

plications Program instrumentation pods; and use of commercial computer software for operating systems, data base management and interactive graphics.

- Centralized management and a system engineering focus to assure coordinated, compatible development



EXER 17

BATTLE FORCE/GROUP QUICK LOOK RECONSTRUCTION

1991

Using the building block approach, the following equipment and transmission paths can be available to the fleet in 1991.

The focus is on time, position and engagement data which are needed to support rapid turnaround and meaningful feedback to the Battle Group and Warfare Commanders.

Each of the equipments can be separated into three categories

Tried and Tested

- INMARSAT
- Naval Message/Fleet Satellite

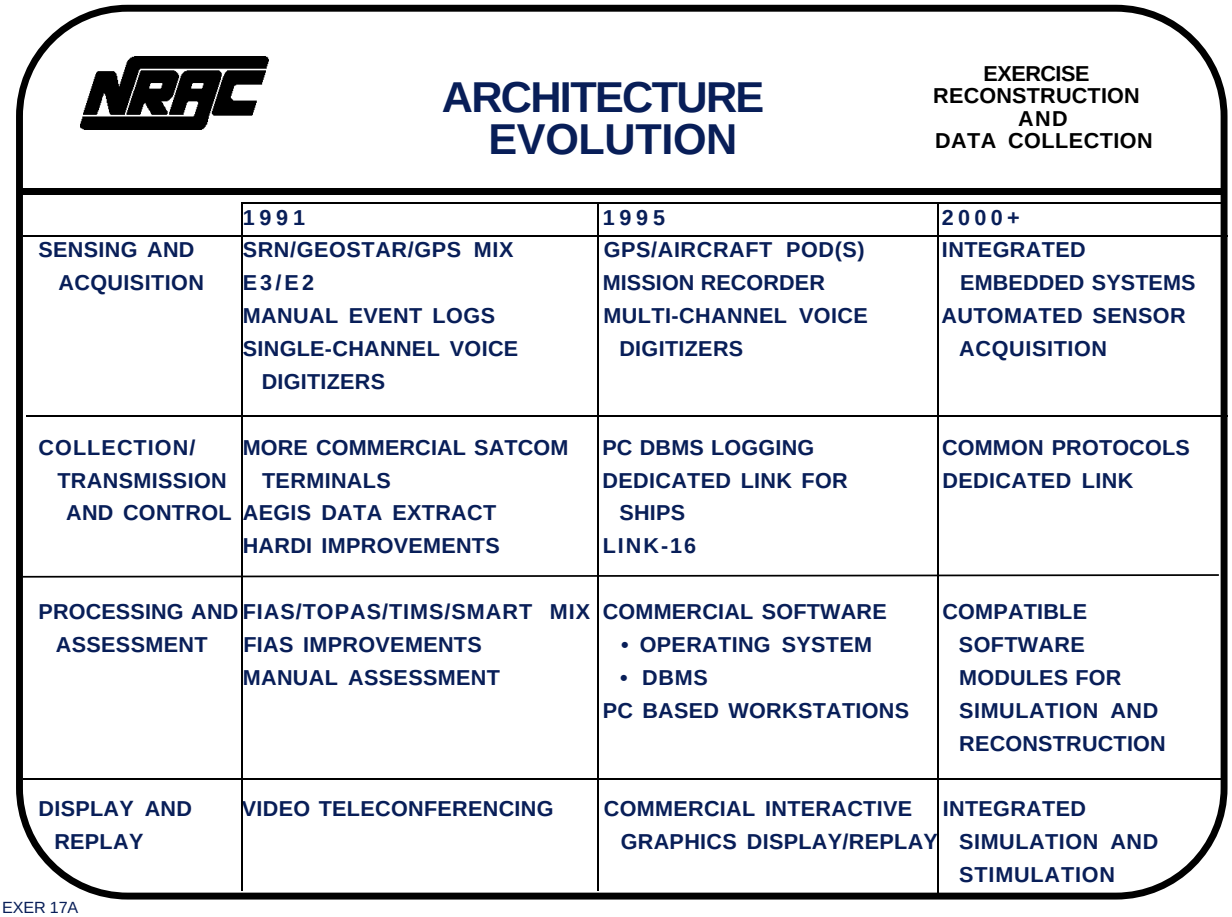
Tried, Tested, Needs Work

- FIAS and TOPAS
- HARDI, Hawkeye Airbourne Recording Digital Instrumentation
- GEOSTAR
- SRN/GPS => NFORM
- SFMPL, Submarine Fleet Mission Program Library
- Single channel voice digitizer

Testing in Progress

- AEGIS quick look data extract
- AWACS data extraction

These are all components of a rudimentary system that will provide low cost/high payoff benefits in the near term.



EXER 17A

ACHITECTURE EVOLUTION

The evolution of the architecture for the data collection and exercise reconstruction process from now to beyond the turn of the century embodies the following major themes:

1. Application, rather than development, of technology
2. The primacy of GPS for position determination
3. Extensive use of commercial PC-based hardware and software
4. Extensive employment of simulation and stimulation
5. Eventually, an integrated process with interoperable elements

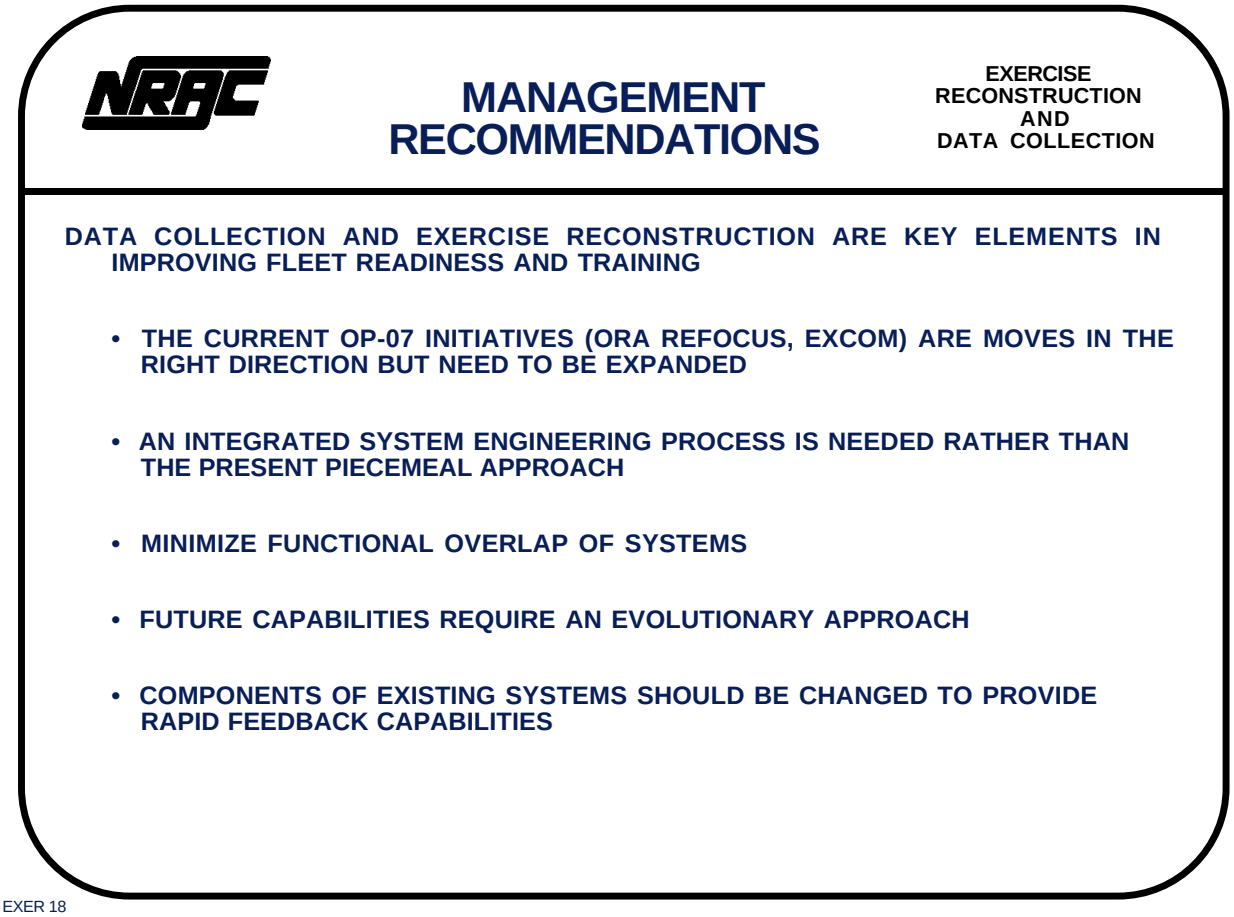
The panel envisions that the 1991 time frame building block in the evolutionary process would emphasize improving existing systems to provide more automated quick look data. Emphasis would be on procurement of automated extraction/collection systems such as NFORM/SFMPL for position data; updated E-2 HARDI system with PC - compatible data extraction; improving the turn-around time for data extracted from E-3 AORTA tapes; development of Aegis quick look data extraction capability; procurement of additional SATCOM terminals; and improvement to the PC-based FIAS.

For the 1995 time frame, the major emphasis would be on incorporation

of available DOD and commercial technology to enhance BGE effectiveness. Specific items are accelerated procurement of GPS receivers to be installed in most Navy platforms (surface, subsurface and air); introduction of LINK-16 to replace LINK-11; procurement of the Joint Services Range Applications Program instrumentation pod; introduction of aircraft mission recorders; adoption of commercial PC-DBMS for automation of key event data; development of weapons systems key event data extraction capability; installation of multichannel digital voice systems; use of a dedicated link for networking/distribution of quick look data between BG surface ship participants; and development of PC-based processing and assessment systems which maximize the use of commercial software operating systems, graphics systems and interactive display and replay capability.

For the year 2000 and beyond, the panel envisions fully automated, integrated and embedded BG data collection and reconstruction systems. These will include:

- Automated embedded system to extract position, weapon and sensor data from each participant;
- Dedicated SATCOM links for transmission of data from participants to central site and subsequent return transmission of reconstruction product;
- Integrated simulation/stimulation/reconstruction system using high speed, distributed processing architecture and compatible software modules with advanced PC-based work stations.



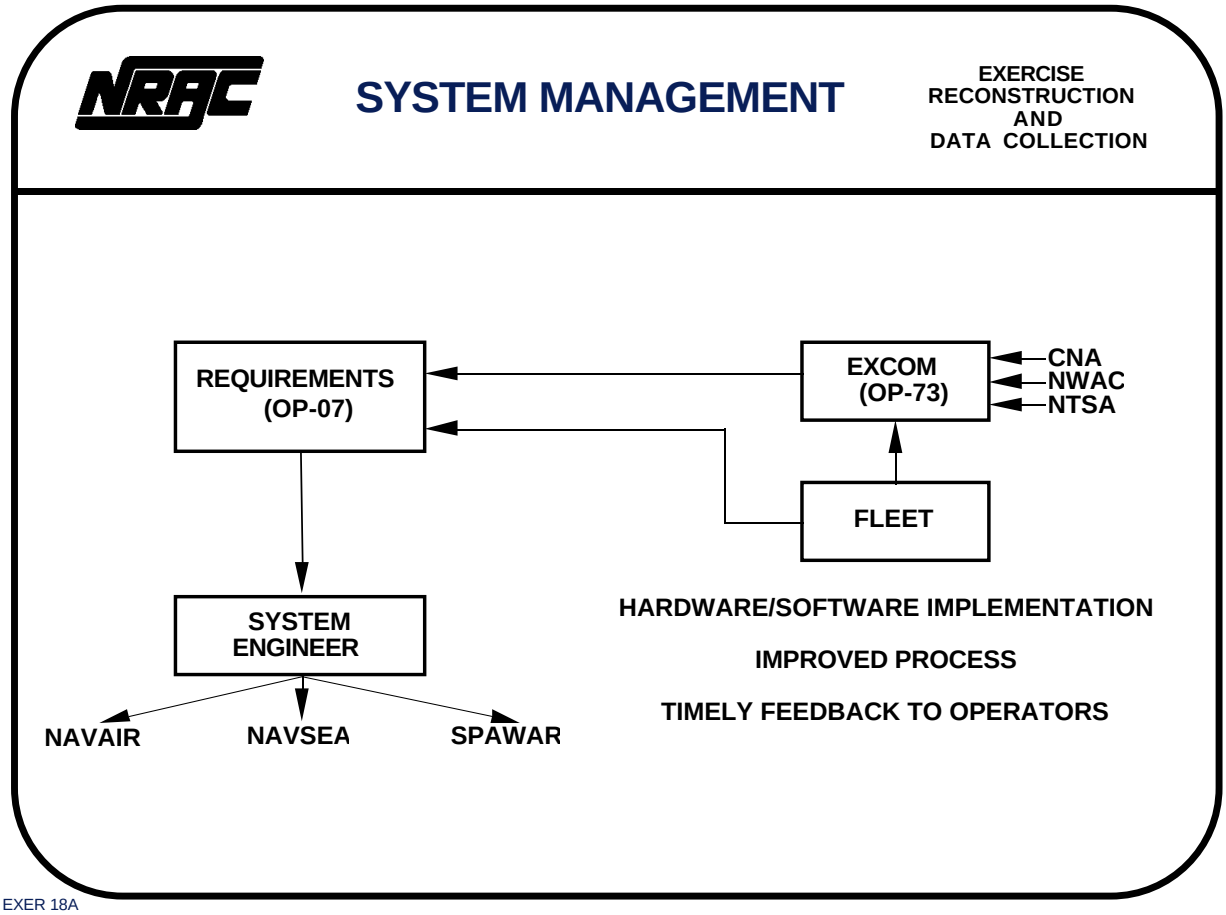
MANAGEMENT RECOMMENDATIONS

The Navy's ability to utilize its Battle Group exercises for training and to assess warfighting capability is greatly dependent on timely and effective exercise reconstruction and data collection efforts. The importance of these efforts demands top level management attention and establishment of a systems engineering focus.

The NRAC Panel finds that the current OP-07 initiatives—the refocused Operational Readiness Assessment Program (ORA) and the EXCOM Committee—represent steps in the right direction. ORA, in its refocused form, provides a necessary vehicle for implementation of near term solutions to current problems. The program should be protected and expanded to encompass near term recommendations made in this report. The EXCOM Committee, with representation from all interested parties, can serve as an effective means to bring about coordination of the diverse systems and programs now in use or planned. This committee will benefit greatly from a clear charter and strong leadership.

The requirements evolving out of an improved and strengthened management structure must be responded to by utilizing integrated systems engineering methodology. It is only through this approach that the Navy can be assured that the present and future exercise reconstruction and data collection hardware and software requirements are addressed efficiently, without overlap

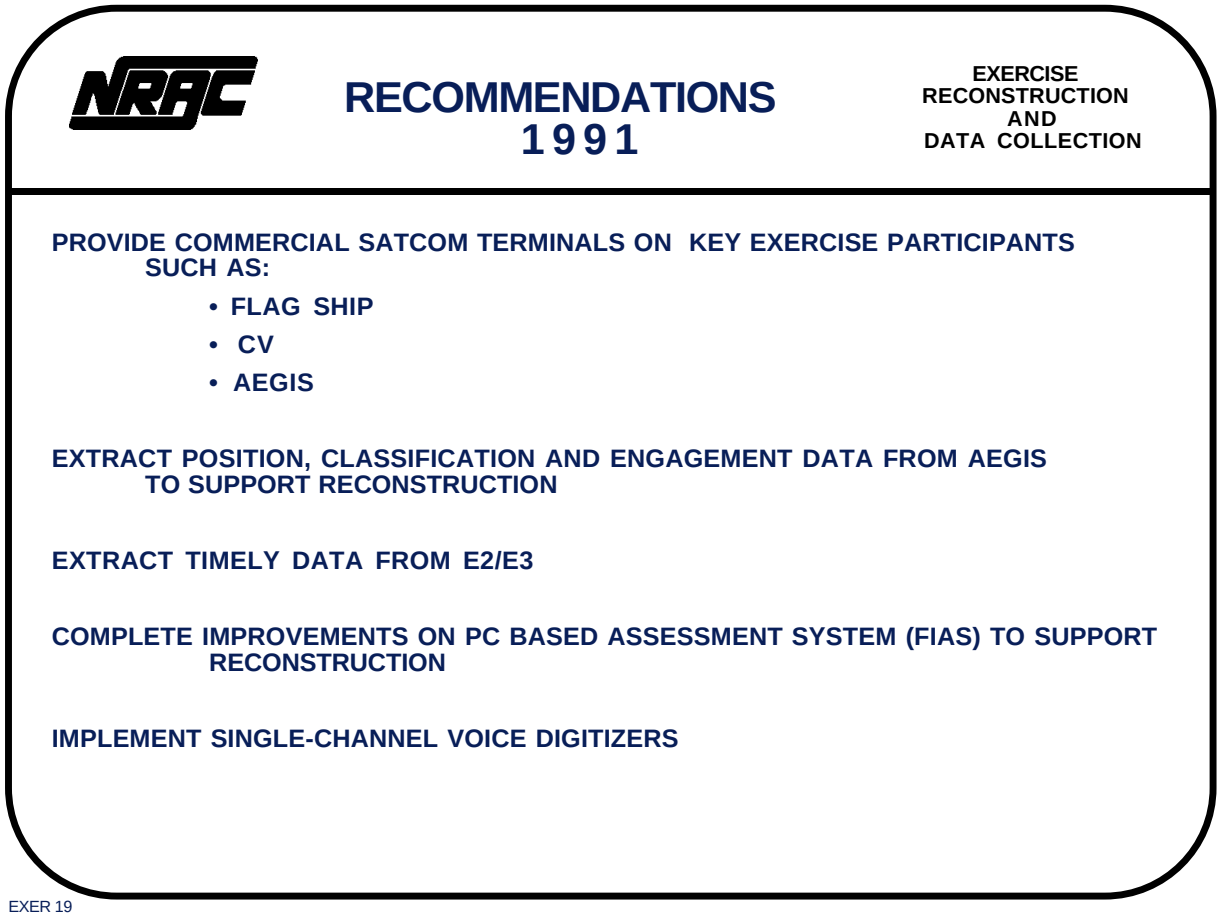
and with a minimal amount of competition for funds. Immediate attention must be directed toward coordinating current efforts to provide rapid and accurate feedback to fleet and battle group commanders.



SYSTEM MANAGEMENT

To address the overall need for a Navy focus on the issue of exercise reconstruction and data collection, the NRAC Panel recommends the establishment of a flow process that incorporates the current OP-07 initiatives, the fleet inputs, and inputs from CNA, NWAC and NTSA. This process will generate a set of requirements to drive a systems engineering effort for determination of an optimal set of hardware and software sub-systems leading to improved data collection and timely feedback to the fleet commanders. The systems engineering activity would form the proper bridge between the fleet, data collectors and reconstructors, and the hardware/software designers controlled by the SYSCOMS. This activity will ensure the development of a comprehensive data collection and reconstruction system that meets requirements and falls within budgetary constraints.

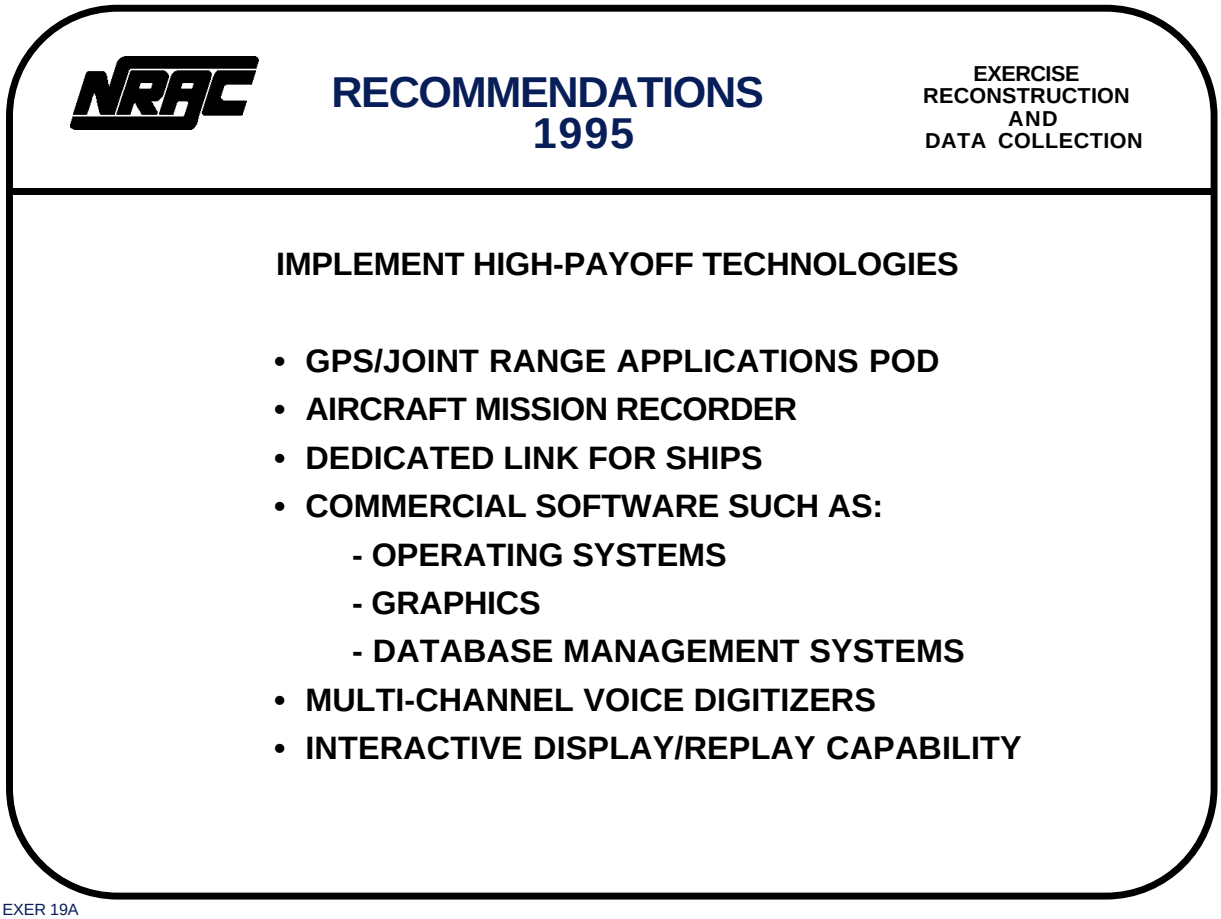
Employment of an effective systems engineering process will result in the preparation of a systems engineering management plan requiring hardware and software specifications. These specifications will ultimately form the basis for the evolution of the desired data collection system. The systems approach will also allow the Navy to conduct trade-off studies to determine the optimal mix of hardware and software solutions to meet the fleet's needs, while living within budgetary constraints.



RECOMMENDATIONS - 1991

At present, the major ships in a battle group each obtain a variety of data, including locally different presentations of Link-11 data as a result of varying transmission paths and characteristics. With commercial satellite terminals deployed on carriers, Aegis cruisers and the flagship, all of their data can be transmitted, received, and correlated at a central locations. Also, the reconstruction team could take into consideration the actual Link-11 information available to the Battle Group Commander.

Software is needed to quickly extract selected position and engagement data from Aegis data tapes. The E-2 airborne recorder (HARDI) must be made reliable. The turnaround time of E-3 mission (AORTA) tapes must be reduced. Improvements underway on the PC based FIAS assessment system need to be finished. Single-channel voice digitizers with time tag capability that will provide accurate records in support of command and control are now available and should be implemented. At present, these data are usually hand recorded and sent as messages which are inaccurate, hard to correlate, or often missing.



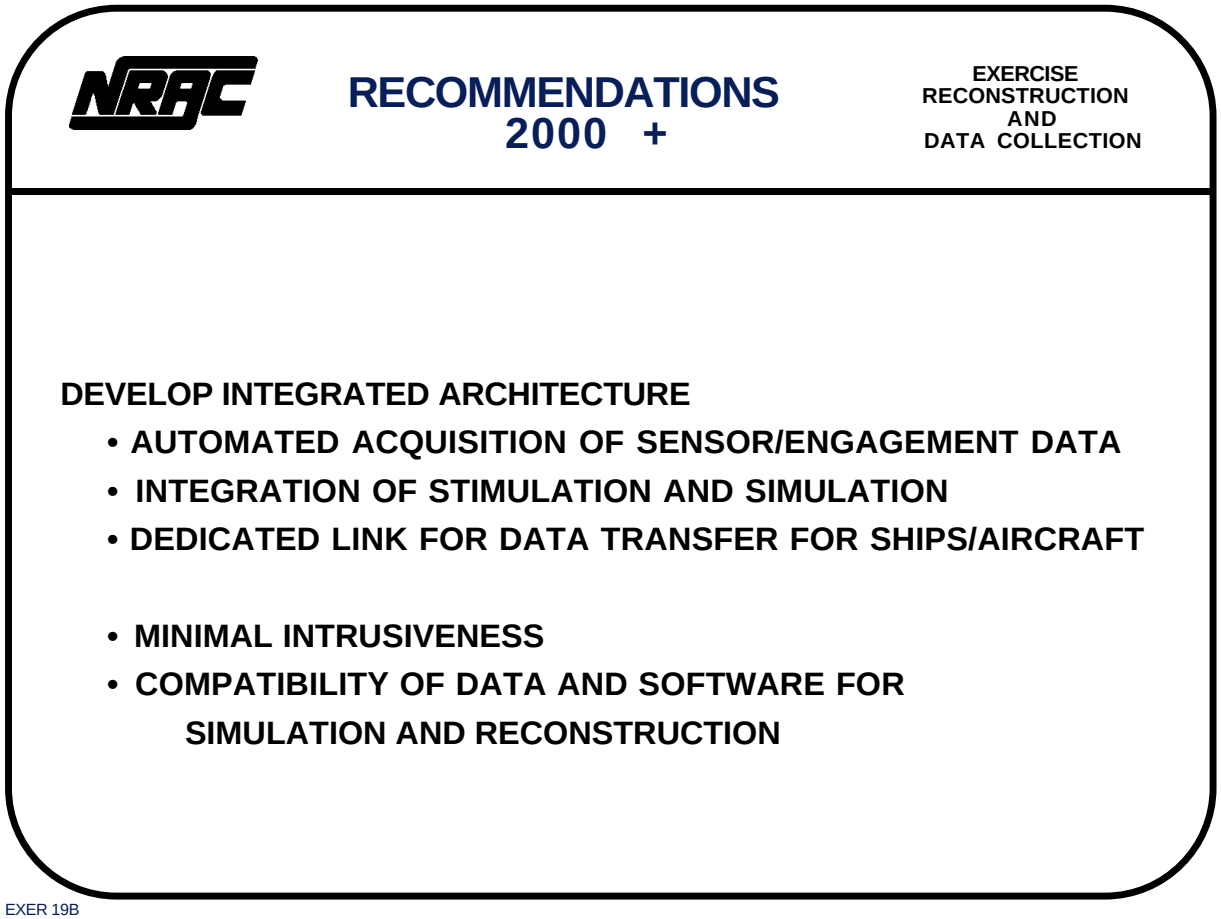
EXER 19A

RECOMMENDATIONS - 1995

The Navy is now in the process of installing GPS receivers. The installation of GPS receivers on airplanes needs to be accelerated. As an interim measure, GPS receivers will be available on the Joint Services Range Application instrumentation pods. The derived position versus time information, along with position and event data, will be recorded on an aircraft mission recorder planned for development.

A dedicated radio link will automate accurate transmission of all data to a central point in the battle group. Multi-channel voice digitizers will provide more accurate automatic event and decision logging capability, also capable of being transmitted to a central point.

The software for quick look can be upgraded by using commercially available packages like graphics. An interactive display capability will permit rapid feedback which can be viewed locally or played on a video conference.

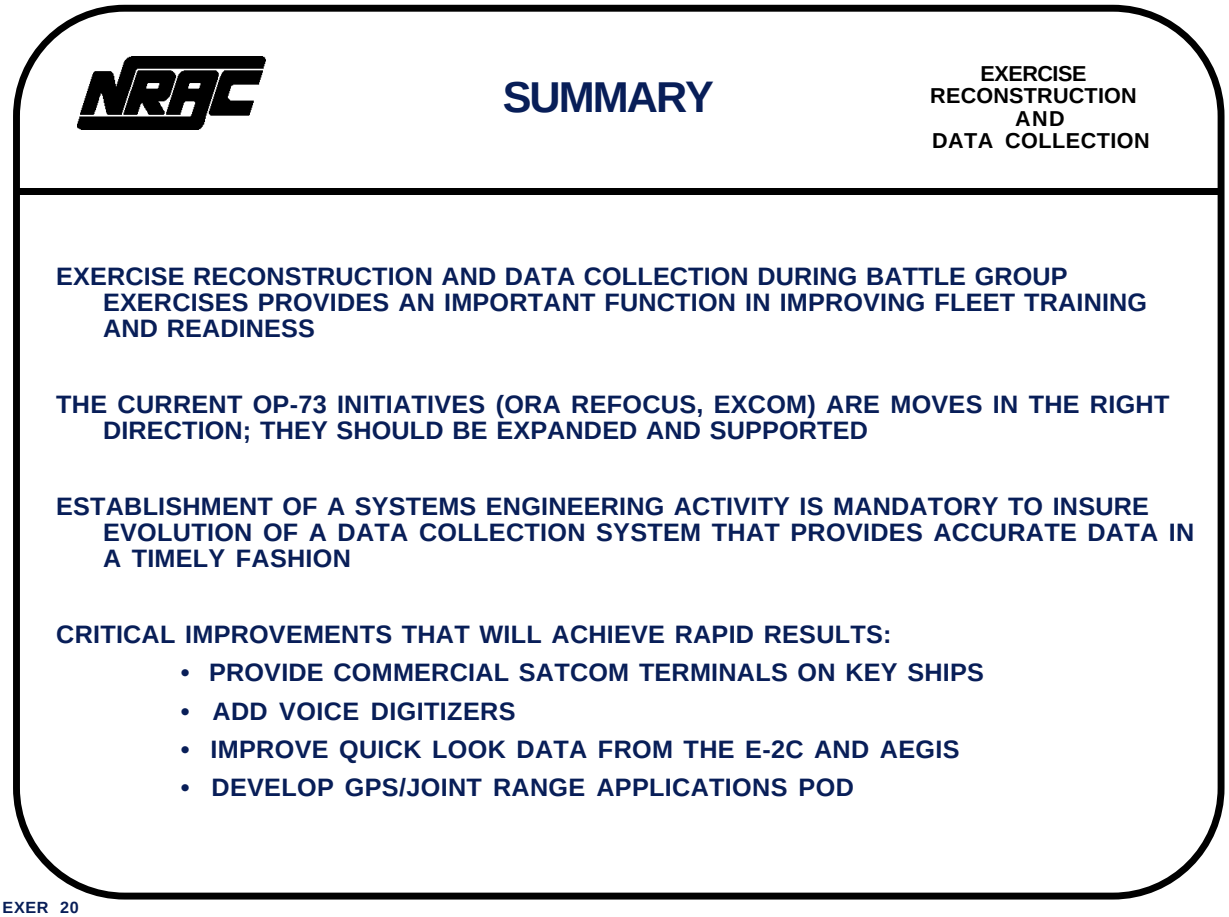


RECOMMENDATION 2000+

The NRAC Panel's approach to resolving the Navy's exercise reconstruction and data collection problem involves an evolutionary process that ultimately results in the development and fielding of a system architecture that will be characterized by automated acquisition of data. These data will be transferred to the quick look analysts via dedicated links. The architecture will include two data transfer modes, a dedicated one and a shared link for less time-sensitive data, like digitized voice.

Integration of real and simulated targets with exercise events will permit expanding an exercise to include more platforms at minimal cost. The software to process and sort exercise data must be compatible between the simulation and the reconstruction.

The data collection process must be minimally intrusive to the conduct of the exercise since the main objective is training.



SUMMARY

In summary, the NRAC Panel on Exercise Reconstruction and Data Collection recognizes the high value in providing immediate feedback to the Fleet and Battle Group Commanders during a BG exercise to assist in identifying shortcomings, establish additional training requirements, and assess war fighting capability. It is paramount that this information be made available to the Fleet on a timely basis so that all the benefits can be realized. In addition, longer term analysis of the data can provide "lessons learned" for future commanders of battle groups.

The current process of data collection is a piecemeal approach that does not provide accurate and timely data to the Fleet. In recognition of this, OP-73

has two initiatives underway (EXCOM and ORA refocus) that will move the Navy toward the goal of capitalizing upon exercise data to enhance training and Battle Group readiness. The NRAC Panel believes that these initiatives should be broadened in scope and should drive a systems engineering process that evolves the hardware and software sub-systems necessary to meet the Fleet's objectives.

The NRAC Panel finds that several short-term efforts will provide an immediate boost in the Navy's ability to provide feedback to the Fleet on a quick look basis. These critical improvements include providing a commercial SATCOM terminal on key surface combatants; adding voice digitizing capability; improving the timeliness of the quick look data obtained from the E-2 and Aegis; and the development and employment of a DoD/Joint Services Range Applications Program instrumentation pod.

A Navy commitment to resolve the exercise reconstruction and data collection problem must include the implementation of a management and systems engineering process that ensures the central coordination and effective employment of immediate improvements, and the evolution of a data collection system that incorporates the latest available technology (commercial and military) to meet the needs of the fleet commanders.